

## **2006 Annual Report – Final**

### **Pallid Sturgeon Population Assessment and Associated Fish Community Monitoring for the Missouri River: Segment 4**



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## EXECUTIVE SUMMARY

The Missouri River below the confluence of the Yellowstone River is a highly dynamic system and features a diverse assemblage of habitats that typify the historic conditions of the river. The influence of the Yellowstone River and the seasonal fluctuations in the hydrograph, including the immense sediment load, greatly influence the fish community, including the pallid sturgeon.

Sampling for segment 4 started in early May. This was the second year of sampling under the standardized sampling regime devised for the Missouri River. A full compliment of standard gears were deployed during both the sturgeon and fish community seasons.

Pallid sturgeon (*Scaphrynychus albus*) is the primary target of this sampling effort. Although the population within this segment of the Missouri River is typified by older individuals with very little indication of wild fish recruitment, the stocking efforts have provided an opportunity to gain further insight into this earlier life stage.

A total of 27 pallids were captured in segment 4 in 2006, with 25 of the pallid sturgeon being captured using standard protocols and gears, while two were captured in a nonrandom bend. Seven of the pallid sturgeon were captured during the sturgeon season in May and June. The remaining 20 pallids were captured during the fish community season. In 2006, the percentage of pallids originating from previous stocking events was about 88% (N = 22), whereas in 2005, 81% of the pallids captured were hatchery stocked. Two juvenile pallid sturgeon sampled in 2006 had no previous tags or marks and are suspected to be hatchery fish stocked without tags in 2004 or 2005. Results from analysis of tissue samples sent to the Abernathy Fish Technology Center will determine genetically whether these fish are hatchery stocked or wild.

Of the three pallids that were considered wild, all three were previously captured and had PIT tags implanted. Seven of the eight year classes that have been stocked were sampled during 2006. The only year class of stocked pallid sturgeon that were not sampled was the 1999 year class. The standard trammel net accounted for 74% (N=20) of the pallid captures, while the otter trawl caught 26% (N=7). The 2005 sampling had similar results, with 77% of the pallids

captured using trammel nets and 23 % captured in otter trawls. Although age data is not available based on fork length, young of the year and one year old sturgeon were sampled. The majority of these were identified as shovelnose sturgeon. Relative condition factors for all pallid sturgeon captured during this effort ranged from 0.842 to 1.214. Growth rates for recaptured juvenile sturgeon ranged from 0.11 to 0.52 mm/day. Pallid sturgeon are widely distributed throughout this segment as they were sampled in eleven of the twelve bends. Inside bend macrohabitats produced the most pallid sturgeon followed by channel crossovers and outside bends. Channel border and island tip mesohabitats produced most of the pallid sturgeon captures.

Shovelnose sturgeon (*S. platyrhynchus*) were captured in trammel nets (N=298), otter trawls (N=91), and beam trawls (N=26). Sub-stock shovelnose sturgeon (FL<249 mm) made up 2.6% of the catch in trammel nets, 40% in otter trawls, and 50% of the catch in beam trawls.

In 2006, seven of the eight native Missouri River species that were targeted for this assessment were sampled. Sturgeon chub (*Macrohybopsis gelida*) were only sampled during the fish community season. The majority of sturgeon chub were sampled in otter trawls (N =272 ), with mini-fyke nets (N = 3) and beam trawls (N =266 ) capturing the remaining specimens. A total of 308 sicklefin chubs (*M. meeki*) were collected in segment 4 with most sicklefin chubs being captured in the otter trawl (N = 222). Speckled chubs (*M. aestivalis*) were the only targeted native species not captured in any gear. Eight sand shiners (*Notropis stramineus*) were sampled in 2006. Seven were captured in a mini-fyke net and 1 in the otter trawl. *Hybognathus* spp. were the most abundant targeted native river species sampled. Most *Hybognathus* spp. were captured during the fish community season in mini-fyke nets (N = 429). A total of 3 *Hybognathus* spp. were captured in the otter trawl. A total of 13 blue suckers (*Cycleptus elongates*) were collected in trammel nets (N = 10) and otter trawls (N = 3). Sauger (*Sander canadense*) were captured in all gears during both seasons. Mini-fyke nets (N = 93) captured the most sauger, followed by trammel nets (N = 72), otter trawl (N =19), and beam trawl (N = 6). A total of 60,908 fish representing 31 species were sampled in segment 4 of the Missouri River during 2006.

# TABLE OF CONTENTS

Introduction.....	1
Study Area .....	4
Methods.....	6
Sample site selection and description .....	6
Sampling gear .....	7
Data Collection and Analysis.....	9
Results	
Pallid sturgeon .....	11
Shovelnose X Pallid Sturgeon Hybrids.....	39
Shovelnose sturgeon .....	40
Sturgeon chub .....	59
Sicklefin chub .....	66
Speckled chub .....	73
Sand shiner.....	79
<i>Hybognathus</i> spp.....	86
Blue sucker.....	93
Sauger .....	103
Missouri River Fish Community .....	113
Discussion.....	115
Acknowledgments.....	118
References.....	119
Appendices.....	120

## LIST OF TABLES

Table 1. Number of bends sampled, mean effort per bend, and total effort by macrohabitat for segment 4 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005 – 2006. ....13

Table 2. Number of bends sampled, mean effort per bend, and total effort by mesohabitat for segment 4 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005 – 2006. ....14

### **Pallid sturgeon**

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2005 -2006. Means (minimum and maximum) are presented.....16

Table 6. Mean fork length, weight, relative condition factor (Kn), growth rates, and water temperature for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2006 from segment 4 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993) .....19

Table 7. Incremental relative stock density (RSD) for all pallid sturgeon captured with all gear by a length category during 2005 - 2006 in the Missouri River. Length categories<sup>b</sup> determined using the methods proposed by Shuman et al. (2006) .....20

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....29

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....30

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....31

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....32

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....33

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....34

Table 15. Total number of quality size and greater ( $\geq 630$  mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....35

Table 16. Total number of quality size and greater ( $\geq 630$  mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....36

### **Shovelnose sturgeon**

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....49

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....50

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....51

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....52

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006.....53

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....54

Table 23. Total number of quality size and greater ( $\geq 380$  mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....55

Table 24. Total number of quality size and greater ( $\geq 380$  mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....56

Table 25. Incremental relative stock density (RSD) and mean relative weight ( $W_r$ ) by a length category for shovelnose sturgeon in segment 4 of the Missouri River captured during 2005 - 2006.....58

### **Sturgeon chub**

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....63

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....64

### **Sicklefin chub**

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....70

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....71

### **Speckled chub**

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....77

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....78

### **Sand shiner**

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....83

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....	84
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

### ***Hybognathus* spp.**

Table 34. Total number of <i>Hybognathus</i> spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....	90
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

Table 35. Total number of <i>Hybognathus</i> spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....	91
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----

### **Blue sucker**

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....	100
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006.....	101
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

### **Sauger**

Table 38. Total number of saugers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....	110
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006. ....	111
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

## LIST OF FIGURES

Figure 1a. Map of segment 4 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 4 encompasses the Missouri River from the confluence with the Yellowstone River (River Mile 1582.0) to the headwaters of Lake Sakakawea (River Mile 1535.0) .....5

Figure 1b. Distribution of: A) seasonal sampling effort and B) pallid sturgeon captures by river mile for segment 4 in randomly selected bends of the Missouri River during 2005 - 2006. Sampling effort of 2 indicates bend sampled in both sturgeon and fish community seasons. Sampling effort of 1 indicates bend sampled in only one season. Black bars represent pallid captures during sturgeon season and white bars during fish community season.....15

### **Pallid sturgeon**

Figure 2. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....23

Figure 3. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....24

Figure 4. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....25

Figure 5. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....26

Figure 6. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....27

Figure 7. Mean annual catch-per-unit-effort ( $\pm$  2 SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification. ....28

Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006 including non-random and wild samples. ....37

Figure 9. Annual capture history of wild (black bars) and hatchery reared (white bars) pallid sturgeon collected in segment 4 of the Missouri River from 2005 to 2006. Figure is designed to compare overall pallid sturgeon captures from year to year and may be biased by variable effort between years. ....38

### **Shovelnose sturgeon**

Figure 11. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $\geq$  380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....42

Figure 12. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $\geq$  380 mm; black bars) shovelnose sturgeon using 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....43

Figure 13. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $>$  380 mm; black bars) shovelnose sturgeon using beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....44

Figure 14. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $\geq$  380 mm; black bars) shovelnose sturgeon using 1 inch trammel nets and otter trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. ....45

Figure 15. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $\geq$  380 mm; black bars) shovelnose sturgeon using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2005 - 2006. ....46

Figure 16. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $\geq$  380 mm; black bars) shovelnose sturgeon using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.....47

Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.....57

## **Sturgeon chub**

Figure 18. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....60

Figure 19. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. ....61

Figure 20. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sturgeon chub using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2005 - 2006. ....62

Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.....65

## **Sicklefin chub**

Figure 22. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....67

Figure 23. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. ....68

Figure 24. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sicklefin chub using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....69

Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.....72

## Speckled chub

Figure 26. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

.....74

Figure 27. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub in segment 4 of the Missouri River during fish community season 2005 - 2006.....75

Figure 28. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....76

## Sand shiner

Figure 30. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sand shiner with otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

.....80

Figure 31. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sand shiner with otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.

.....81

Figure 32. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sand shiner with mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....82

Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006. ....85

## *Hybognathus* spp.

Figure 34. Mean annual catch-per-unit-effort ( $\pm$  2SE) of *Hybognathus* spp. with otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

.....87

Figure 35. Mean annual catch-per-unit-effort ( $\pm$  2SE) of *Hybognathus* spp. with otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.

.....88

Figure 36. Mean annual catch-per-unit-effort ( $\pm$  2SE) of *Hybognathus* spp. with mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....89

Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.....92

## **Blue sucker**

Figure 38. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.....94

Figure 39. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005 - 2006.  
.....95

Figure 40. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.....96

Figure 41. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 4 of the Missouri River during fish community season 2005 - 2006.....97

Figure 42. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue suckers using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....98

Figure 43. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006. ....99

Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006. ....102

## **Sauger**

Figure 45. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.....104

Figure 46. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005 - 2006. ....105

Figure 47. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.....106

Figure 48. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using otter trawls and 1 inch trammel nets in segment 4 of the Missouri River during fish community season 2005 - 2006.  
.....107

Figure 49. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006. ....108

Figure 50. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.....109

Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006. ....112

## LIST OF APPENDICES

Appendix A. Phylogenetic list of Missouri River fishes with corresponding letter codes used in the long-term pallid sturgeon and associated fish community sampling program. ....	121
Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long term pallid sturgeon and associated fish community sampling program.....	127
Appendix C. List of standard and wild gears, their corresponding codes in the database, seasons deployed, years used, and catch-per-unit-effort units for collection of Missouri River fishes for the long-term pallid sturgeon and associated fish community sampling program .....	128
Appendix D. Stocking locations and codes for pallid sturgeon by Recovery Priority Management Area in the Missouri River Basin.....	129
Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 4 of the Missouri River (RPMA 2). ....	130
Appendix F. Total catch, overall mean catch per unit effort, and mean CPUE by mesohabitat within a macrohabitat for all species caught during sturgeon season and fish community season combined in segment 4 of the Missouri River during 2005 - 2006 .....	134
Appendix F1. Gill Net: . ....	135
Appendix F2. 1 Inch Trammel Net: .....	136
Appendix F3. 2.5 Inch Trammel Net: .....	138
Appendix F4. Otter Trawl: .....	139
Appendix F5. Beam Trawl: .....	141
Appendix F6. Mini-fyke Net: .....	143
Appendix G. Hatchery names, locations, and abbreviations. ....	145
Appendix H. Alphabetic list of Missouri River fishes with total number caught by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2005 - 2006 for segment 4 of the Missouri River .....	146
Appendix I. Comprehensive list of bend numbers and bend river miles for segment 4 of the Missouri River comparing bend selection between years from 2005 - 2006 .....	147

## **Introduction**

Since 1990, when the pallid sturgeon (*Scaphirhynchus albus*) was listed as an endangered species and 1993 when the Pallid Sturgeon Recovery Plan was implemented, the primary emphasis of restoration and recovery efforts has been to restore habitat conditions, prevent the immediate extirpation of the species, and increase our knowledge of this ancient fish. Unlike other sturgeon species in the world, very limited information has been available from the historical perspective for the pallid sturgeon, primarily due to the rare status and the lack of historic research work on the big rivers of the central United States. In the last decade, emphasis has been shifting to the development of a more thorough understanding of the species that rely and reside in these ecosystems. However, a great amount of uncertainty still exists about what is needed to prevent the pallids' extinction and how to effectively improve habitat conditions with the multitude of uses for the limited resource. Increased and sometimes conflicting uses of water in big river systems is requiring that communities, states, and the Federal Government collaboratively develop management strategies that balance the multiple uses and provide adequate habitats for the aquatic communities. This monitoring program is designed to assist in that decision process by providing trend information on the pallid sturgeon and related aquatic communities.

The strategy as outlined in the Missouri River Standard Operating Procedures for Sampling and Data Collection (SOP's) (Drobish 2006) details the methodology and information to be collected under this program. This monitoring effort is a collaborative effort of State and Federal biologists all working toward the same goals. It is considered a long term monitoring due to the need to develop trend information that describes the condition of the population and a causal relationship with the environmental conditions that exist. A great deal of variation exists within the aquatic populations, habitats, and conditions on the Missouri River.

### **Sampling Season and Species**

This program has been developed with two sampling seasons (sturgeon and fish community) based primarily on water temperatures. The primary objective of the two seasons is to focus efforts that are

conducive to capturing sturgeon using gears that are temperature limited and utilize other gears toward the fish community during the summer and fall months.

Although gill nets appear to be an effective method for capturing sturgeon for downstream segments, with agreement from the Governance Committee, we have declined to use that method during the sturgeon season, primarily due to the lack of habitats where this gear is effective and the propensity of the gear to cause mortality. The habitats within segment 4 do not contain sufficient areas of slack water that would allow a gill net to fish effectively and would likely fill with debris to the point that either the net would be lost or cause undue mortality on captured fish.

The fish community season sampling began on July 1 and continued until late October when water temperatures reached about 9°C. Five gear types were deployed during the fish community season: mini-fyke nets, trammel nets, large mesh trammel nets, beam trawl, and the otter trawl.

Under this program, sampling is conducted at the bend level with bends randomly selected. A total of 12 bends were selected and sampled randomly with standard gears, and one additional random bend in the Yellowstone River was sampled with trammel nets and otter trawl.

During the fish community season, in addition to targeting sturgeon, the monitoring program has also selected eight native fish species to monitor to gain a greater understanding of the influences of flows and habitat usage. These species are shovelnose sturgeon, blue sucker, sauger, sturgeon chub, sicklefin chub, speckled chub, plains and western silvery minnow, and the sand shiner.

### **Success Criteria:**

In response to the 2000 Missouri River Biological Opinion, the COE is developing monitoring and restoration projects to avoid jeopardizing pallid sturgeon populations. As part of their Implementation Plan, the COE is working with the U.S. Fish and Wildlife Service (USFWS) and State Resource Agencies to develop and conduct a pallid sturgeon monitoring and assessment program. Evaluation of the ultimate success will be tied directly to the biological assessment and the resulting information that these assessments provide. The following four statements may be used to determine whether success is achieved:

1. Develop a monitoring plan to provide the ability to detect population changes.
2. Develop a monitoring plan that identifies survival of hatchery reared and stocked pallid sturgeon in the river.
3. Develop a monitoring plan that identifies reproduction of pallid sturgeon in the Missouri River.
4. Develop a monitoring plan that identifies recruitment of wild pallid sturgeon in the Missouri River system.

The objectives of this program are as follows:

**Objectives:**

1. Document current and long-term trends in pallid sturgeon population abundance and geographic distribution throughout the Missouri River System.
2. Document annual results and long-term trends of habitat usage of wild pallid sturgeon and hatchery stocked pallid sturgeon by season and by life stage.
3. Document the population structure and dynamics of pallid sturgeon in the Missouri River system.
4. Document annual results and long-term trends in native target species population abundance and geographic distribution throughout the Missouri River System.
5. Document annual results and long-term trends of habitat usage of the native target species by season and life stage.
6. Document annual results and long-term trends of all non-target species population abundance and geographic distribution throughout the Missouri River system, where sample size is greater than fifty individuals.

## Study Area

This program encompasses the Missouri River from Fort Peck Dam (RM 1771.5) downstream to the confluence of the Missouri and Mississippi Rivers (RM 0). During development of the methodology that would be used during monitoring efforts, the Pallid Sturgeon Population Assessment Team categorized the study area into 14 segments (Drobish, editor 2006).

Segment 4 is defined as that area of the Missouri River from the Yellowstone River Confluence (RM 1582) downstream to the headwaters of Lake Sakakawea (RM 1574) (Figure 1a). The amount of riverine habitat available for sampling in segment 4 is entirely dependant on reservoir levels. For example, in 2005 and 2006 the river reached below rivermile 1535. At full pool, the reservoir will extend as far up as rivermile 1574; however, the normal reach of river is around rivermile 1550. Although the Yellowstone River is not part of the segment, it does provide a significant amount of influence on this reach of the Missouri River. Seasonal flows, sediment load, and natural temperature fluctuations provide a semblance of the historic conditions that existed prior to development of the Missouri under the Pick Sloan plan.

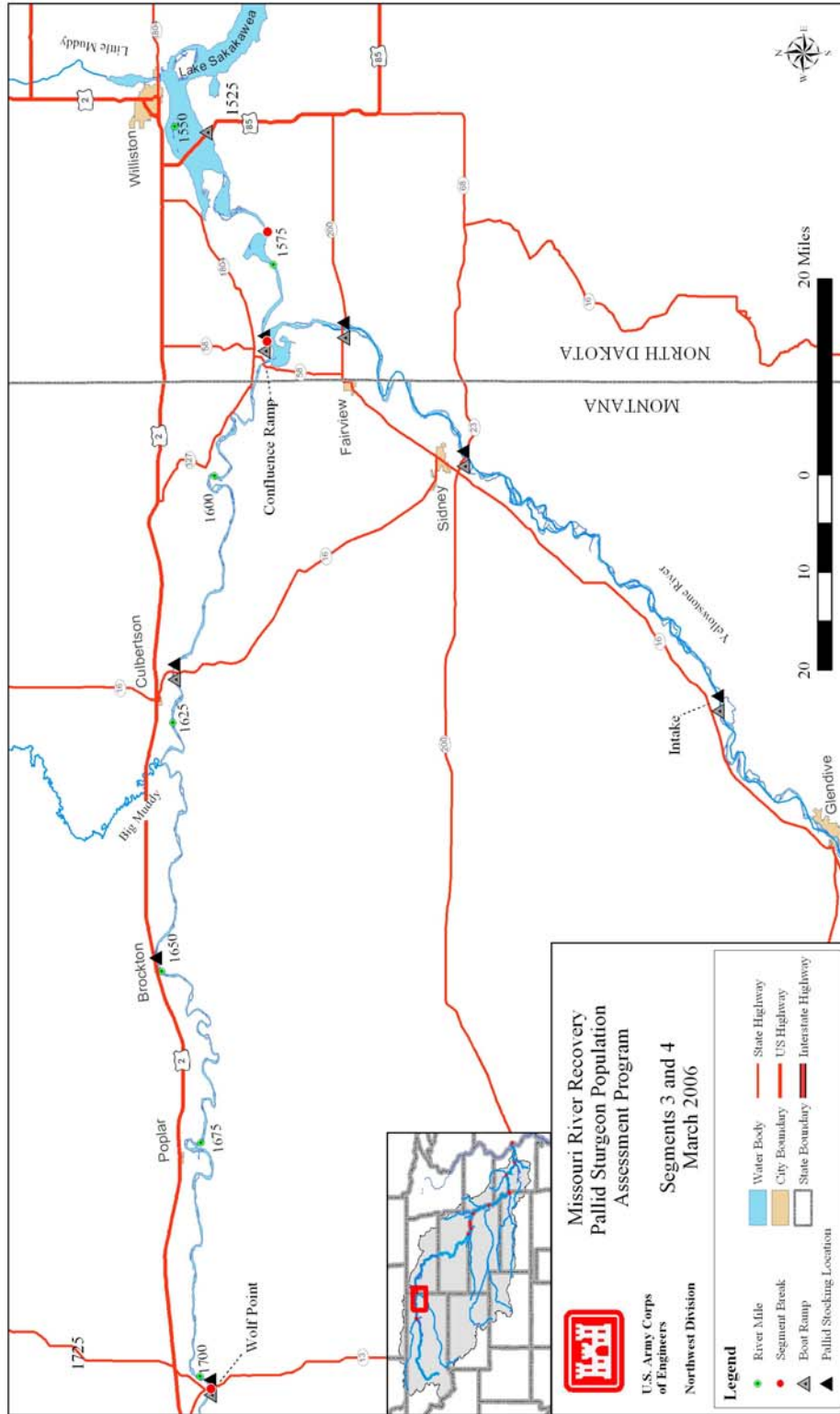


Figure 1a. Map of segments 3 and 4 of the Missouri River with major tributaries, common landmarks, and historic stocking locations for pallid sturgeon. Segment 4 encompasses the Missouri River from the confluence with the Yellowstone River (River Mile 1582) through the headwaters of Lake Sakakawea (River Mile 1568).

## **Methods**

Sampling for segment 4 was conducted in accordance with Standard Operating Procedures established by a panel of representatives from various State and Federal agencies involved with pallid recovery on the Missouri River (Drobish, 2006). The handling protocol for pallid sturgeon was followed using the guidelines established by the USFWS (Jordan 2005).

### **Sampling Site Selection and Description**

A habitat classification system was developed by the Pallid Sturgeon Assessment Team that consists of three continuous macrohabitats found in every bend, main channel cross over, main channel outside bend, and main channel inside bend. An additional 10 discrete macrohabitats have been identified that may not be present in every bend: large tributary mouths, small tributary mouths, confluence areas, large and small secondary connected channels, non-connected secondary channels, deranged channels, braided channels, dendritic channels, and dam tailwaters. Mesohabitats have been established and defined to further classify areas within macrohabitats. Mesohabitat classifications include bars, pools, channel borders, thalweg, and island tips. Bars are sandbars or shallow bankline habitat at the area of terrestrial/aquatic interface, where water depth is less than 1.2 m deep. Pools are areas immediately downstream from sandbars, dikes, snag-piles, or other obstructions that have formed a scour hole greater than 1.2 m deep. Channel borders lie between the maximum depth and 1.2 m depth. Thalweg is the main channel between channel borders conveying the majority of flow which includes the deepest part of the main channel. Island tips are the areas immediately downstream of a bar or island where two channels converge and water depth is greater than 1.2 m. Microhabitats are used to further describe structures within mesohabitats.

Each segment was divided up into sampling units called bends where each bend begins with a channel crossover and contains both an inside bend and outside bend, and ends with the beginning of the next downstream channel crossover. Each bend can contain several macrohabitats and mesohabitats. In 2006, there were 22 bends in segment 4.

## **Sampling Gear**

### **Trammel Net (TN)**

The standard trammel net had a length of 38.1 m (125 ft.), with an inner mesh 2.4 m (8 ft.) deep and two outer walls 1.8 m (6 ft.) deep. The inner mesh was made up of #139 multifilament twine with a bar mesh size of 25.4 mm (1.0 inch). The outer walls were #9 multifilament twine with a bar mesh size of 203.2 mm (8.0 inch). The float line was a 12.7 mm (1/2 inch) foam core and the lead line was 22.7 kg (50 lbs.). Trammel nets were deployed from the bow of the boat and were drifted a maximum of 300 m and a minimum of 75 m after full deployment.

### **Otter Trawl (OT)**

The standard otter trawl had a width of 4.9 m (16 ft.), height of 0.9 m (3 ft.), and a length of 7.6 m (25 ft.). The otter trawl had an inner mesh (6.35 mm (1/4 inch) bar, #18 polyethylene twine) and an outer mesh (38.1 mm (1.5 inch) bar, #9 polyethylene twine), with a cod-end opening of 406.4 mm (16 inch). The inner mesh had a 50.8 mm (2 inch) sleeve sewn along the top section for the insertion of a hoop to keep the net open, allowing fish to reach the cod-end of the net. Trawl doors were 762 mm (30 inches) long by 381 mm (15 inches) high by 19.1 mm (3/4 inch) thick with 12.7 mm (1/2 inch) thick heavy steel runners. The doors were made from marine grade plywood and were used to keep the trawl open and on the river bottom. A 7.9 m (26 ft.) long, 3.2 m (1/8 inch) tickler chain was attached to the bottom front of the trawl for added strength and to disturb the river bottom. Two 30.5 m (100 ft.), 19.1 mm (3/4 inch) thick braided Tenex ropes were attached to each door and tied to the bow railings of the boat. The otter trawl was deployed from the bow of the boat and fished downstream at a rate slightly faster than the current. Each trawl sample covered a minimum of 75 m (246 ft.) and a maximum of 300 m (984 ft.) depending on the habitat being sampled.

### **Beam Trawl (BT)**

The beam trawl was used in segment 1-4 during the fish community season in 2006. The trawl had a width of 2 m (6.4 ft), height of 0.5 m (1.6 ft), and a length of 5.5 m (18 ft). The beam had an inner mesh 0.476 cm (3/16 inch) and an outer chaffing mesh 3.81 cm (1.5 inch) with a 16.5 cm (6.5 in) cod opening. The trawl was attached to a 2 m (6.4 ft) long by 0.5 m (1.6 ft) high steel trawl frame. Two

30.5 m (100 ft), 1.91 cm (3/4 inch) thick braided Tenex ropes were attached to the frame and tied to the bow railings of the boat. The beam trawl was deployed from the bow of the boat and towed downstream at a rate slightly faster than the current. Each trawl sample covered a minimum of 75 m (246 ft) and a maximum of 300 m (984 ft) depending on the habitat being sampled. Paired samples were conducted using the beam trawl and otter trawl in all twelve randomly selected bends. One gear was deployed in all available macrohabitats within a random bend and the next day the other gear was used to sample the same macrohabitats of the same bend.

### **Mini-Fyke Nets (MF)**

The standard mini-fyke nets consisted of two rectangular frames 1.2 m (4 ft.) wide by 0.6 m (2 ft.) long, and two 0.6 m (2 ft.) hoops made of 0.63 cm (1/4 inch) black oil-tempered spring steel. A 4.5 m (15 ft.) long and 0.6 m (2 ft.) lead was connected to the second rectangular frame. The mesh for the frame and lead was made up of 3 mm (1/8 inch) “ace” mesh that was coated for protection. The lead had foam floats on the top and bullet lead weights on the bottom. Mini-fyke nets were set as perpendicular to shore when possible, but a slight downstream set was used more frequently to prevent the net from rolling over in the current. Mini-fyke nets were set in the evening and pulled the next morning with the optimum duration of a set being 18 hours.

During the 2006 fish community season, a new gear was implemented on an experimental basis, “delta” mini-fyke nets. In 2005, we found that the standard mini-fyke nets made with “ace” mesh were not durable when used in segment 4. All of the mini-fyke nets deployed last year sustained damage ranging from several small tears to large holes in the mesh. This damage caused the loss of catch and loss of time due to repairs. More durable mini-fyke nets made of “delta” mesh were compared to the standard mini-fyke nets made of “ace” mesh in 2006. The specifications of the “delta” nets were identical to the “ace” nets with the exception of the mesh material.

## **Data Collection and Analysis**

### **Associated Environmental Data**

GPS locations were taken for each sample using a WAAS enabled GPS receiver with submeter accuracy. Temperature and depth were also recorded at each sampling location. Substrate, velocity, and turbidity were collected randomly for 25% of the mesohabitat types within each macrohabitat. Substrate was sampled using a Hesse sampler and reported as a percentage of silt/sand/gravel within each sample. Velocity was taken at three depths in the water column, bottom, 80%, and 20% of the depth using a Marsh-McBirney Flo-Mate 2000 velocity meter. Turbidity was collected using a Hach 2100P turbidimeter and recorded as NTU (Nephelometric Turbidity Units). Additionally, these measurements were collected whenever a pallid sturgeon was sampled.

### **Genetic Validation**

Genetic samples were taken from all unmarked pallids and potential hybrid sturgeon following the protocol outlined in the SOP's (Drobish 2006). Two fin clips (approximately 1 cm<sup>2</sup> each) were removed from each fish using surgical scissors and forceps. The samples were placed in two separate tubes with 95% non-denatured ethanol and sealed in a plastic bag along with a sturgeon genetic card that contained all the pertinent information for that fish. All genetic samples were sent to the U.S. Fish and Wildlife Service's Abernathy Fish Technology Center for analysis and archiving.

### **Relative Condition**

The relative condition of recaptured hatchery reared pallid sturgeon was calculated using  $K_n = (W / W')$ , where  $W$  is weight of the individual and  $W'$  is the length-specific mean weight predicted by the weight-length equation calculated for that population. Keenlyne and Evanson (1993) provided a weight-length regression [ $\log_{10} W = -6.378 + 3.357 \log_{10} L$  ( $r^2 = 0.9740$ )] for pallid sturgeon throughout its range which was used to calculate a relative condition factor.

### **Relative Stock Densities**

A length frequency index measures changes in fish population structure. Length categories based on the percentage of the largest known pallid sturgeon are as follows (Gablehouse 1984): sub-stock fork

length <330 mm (20%), stock fork length = 330 – 629 mm (20-36%), quality fork length = 630 – 839 mm (36-45%), preferred fork length = 840 – 1039 mm (45-59%), memorable fork length = 1040 – 1269 mm (59-74%), and trophy fork length >1270 mm (>74%) (Shuman et al, 2006).

Length categories based on the percentage of the largest known shovelnose sturgeon are as follows: sub-stock fork length <250 mm (20%), stock fork length = 250 – 379 mm (20-36%), quality fork length = 380 – 509 mm (36-45%), preferred fork length = 510 – 639 mm (45-59%), memorable fork length = 640 – 809 mm (59-74%), and trophy fork length >810 mm (>74%). Proportional Stock Density (PSD) is the proportion of fish of quality size in a stock. Relative Stock Density (RSD) is the proportion of fish of a size group in a stock (Quist 1998).

### **Analyses**

A sample target for each gear was defined as follows: 300 m drift (TN), 300 m tow (OT and BT), and one overnight set (MF). A minimum effort of 75 m for TN, OT, and BT was accepted in some habitats because certain areas have so much debris that long drifts/tows are not possible. Also, due to the length of some habitats available in a bend and the distance required to deploy and retrieve the trawls, it was not possible to sample 300 m without sampling an adjacent habitat. Effort was calculated for trammel nets and trawls as fish per 100 m sampled. Effort was calculated for MF nets as catch per net night. Samples that occurred outside of the “standard” gear or habitat effort or samples that occurred in “non-random” bends were excluded from CPUE calculations. These data were included into length frequencies, relative condition, and population structure calculations.

## **Results**

### **Pallid Sturgeon**

A total of 27 pallid sturgeon were captured in segment 4 for the sampling conducted during the 2006 sturgeon and fish community seasons. Of these, 22 were considered originating from previous hatchery stocking while three of these were considered as wild (Figure 9.). Two juvenile pallid sturgeon that were sampled were unmarked and deemed unknown pending genetic verification.

Fork lengths (FL) of pallid sturgeon sampled in segment 4 ranged from 190 – 1410 mm. This segment is typified by an aging adult population with recruitment resulting from previous augmentation efforts as shown by the length frequency histogram (Figure 8). Almost all the previous year classes of augmented pallids were sampled during 2006, with the exception of the 1999 and 2006 year classes. Comparing recapture information with the information from the time of stocking is showing that these stocked fish are growing at a range of rates (0.109 – 0.353 mm/day) (Table 6.). Data was very limited for calculating relative weights and condition factors on each year class (Table 6). Relative Stock Density was calculated for pallid sturgeon (Table 7).

All untagged juvenile sturgeon (N = 2) that were suspected as being a possible pallid were genetically sampled for submission to the Abernathy Fish Technology Center (FTC) for analysis and archiving.

Tag retention has always been an extremely important aspect of the evaluation of pallid sturgeon augmentation efforts. Of the 27 pallids captured, three pallids were considered wild and were recaptures from previous sampling efforts and had retained their PIT tags. The remaining 22 pallid sturgeon had some type of mark that allowed designation as a fish stocked previously. From the year classes, we can outline some of the retention rates. For the 1997 year class (N=3), all fish had PIT tags and elastomer was present; for the 2001 year

class (N=4), three had retained their PIT tags and the other did not (based on elastomer); and for the 2002 year class (N=6), five fish retained a PIT tag. The 2003 and the 2004 year classes do not allow this type of documentation primarily due to the 2003 year class being stocked with similar elastomer and some fish being stocked without a PIT tag. The pallids originating from the 2004 year class were stocked without PIT tags. Three pallids sampled from the 2005 year class were stocked as fingerlings in the fall of 2005 and were too small to PIT tag prior to stocking.

Utilization of a ratio of pallid sturgeon to shovelnose sturgeon to quantify abundance dates back to early commercial records and field studies (Bailey and Cross, 1954, Fisher, 1962). The 2006 sampling resulted in a ratio of pallid to shovelnose of 1 to 15.4. No known hybrids were collected during this effort.

Table 1. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by macrohabitat (total number of deployments) for segment 4 on the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005 – 2006. N-E indicates the habitat is non-existent in the segment.

Gear	Number of Bends	Mean Effort	Macrohabitat													
			BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Fall through Spring - Sturgeon Season																
1 Inch Trammel Net	12	8.6	N-E	24	-	N-E	N-E	38	31	10	-	-	-	-	-	-
2.5 Inch Trammel Net	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	-	-	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	-	-	N-E	-	-	N-E	N-E	-	-	--	-	-	-	-	-	-
Otter Trawl	12	8.5	N-E	24	-	N-E	N-E	32	27	9	10	-	-	-	-	-
Summer – Fish Community Season																
1 Inch Trammel Net	12	10.2	N-E	30	-	N-E	N-E	38	35	8	11	-	-	-	-	-
Beam Trawl	12	8.2	N-E	24	-	N-E	N-E	33	33	4	4	-	-	-	-	-
Mini-Fyke Net	12	7.5	N-E	7	-	N-E	N-E	35	6	23	13	5	-	-	1	-
Otter Trawl	12	8.9	N-E	29	-	N-E	N-E	35	35	5	3	-	-	-	-	-

Table 2. Number of bends sampled, mean effort per bend (mean number of deployments), and total effort by mesohabitat (total number of deployments) for segment 4 in the Missouri River during fall through spring (sturgeon season) and summer (fish community season) in 2005 – 2006. N-E indicates the habitat is non-existent in the segment.

Gear	Number of bends	Mean Effort	Mesohabitat				
			BAR	POOL	CHNB	TLWG	ITIP
Fall through Spring – Sturgeon Season							
1 Inch Trammel Net	12	8.6	-	-	97	-	6
2.5 Inch Trammel Net	-	-	-	-	-	-	-
Beam Trawl	-	-	-	-	-	-	-
Gill Net	-	-	-	-	-	-	-
Otter Trawl	12	8.5	-	-	88	-	14
Summer – Fish Community Season							
1 Inch Trammel Net	12	10.2	1	-	102	-	19
Beam Trawl	12	8.2	-	-	92	-	6
Mini-Fyke Net	12	7.5	71	-	1	-	18
Otter Trawl	12	8.9	-	-	101	-	6

#### Segment 4 - Pallid Sturgeon Captures by River Mile

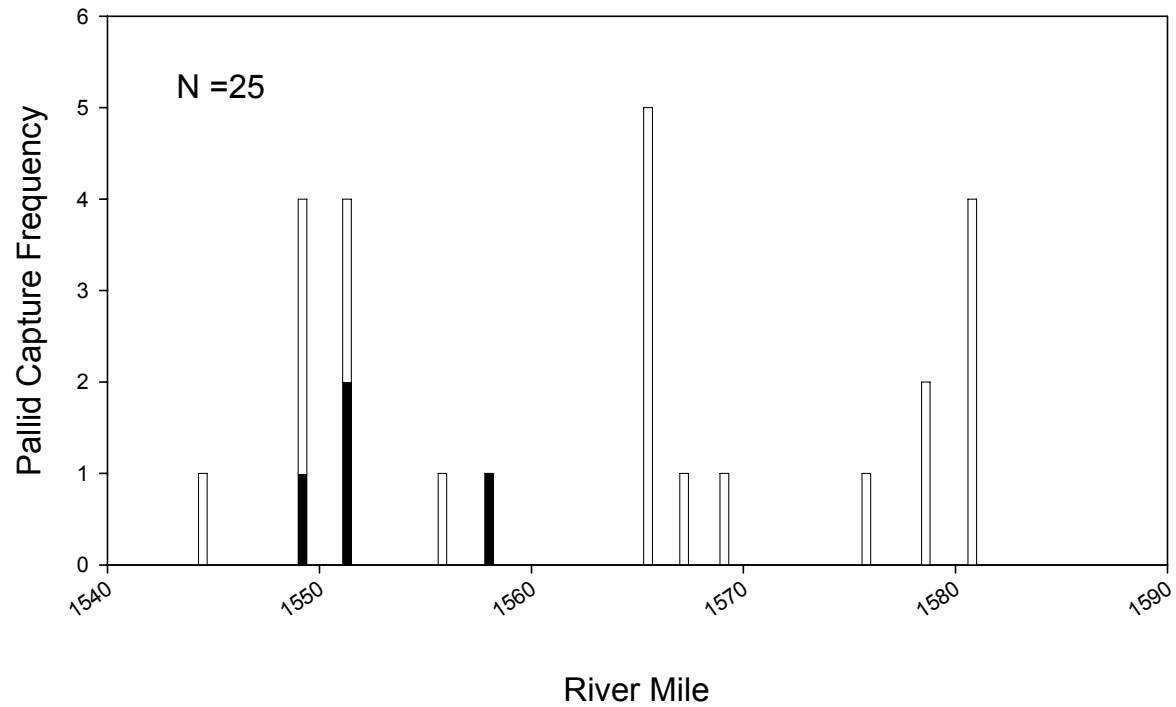


Figure 1b. Distribution of pallid sturgeon captures by river mile for segment 4 of the Missouri River during 2005-2006. Black bars represent pallid captures during Sturgeon Season and white bars during Fish Community Season. Figure included all pallid captures including non-random and wild samples.

Table 3. Pallid sturgeon (PDSG) capture summaries for all gears relative to habitat type and environmental variables on the Missouri River during 2005-2006. Means (minimum and maximum) are presented. Habitat definitions and codes presented in Appendix B. N-E indicates the habitat is non-existent in the segment.

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
BRAD	BAR	N-E								
	POOL									
	CHNB									
	TLWG									
	ITIP									
CHXO	BAR	0.6 (0.4-0.9)				13.5 (7.6-20.1)		45 (28-64)		0
	POOL									
	CHNB	3.4 (1-8)	2.5 (2.2-3.5)	0.7 (0.29-1.26)	0.54 (0.39-0.64)	19.1 (5.7-26.4)	18.1 (10.1-21.7)	103 (26-654)	42 (26-65)	7
	TLWG									
	ITIP									
CONF	BAR									
	POOL									
	CHNB									
	TLWG									
	ITIP									
DEND	BAR	N-E								
	POOL									
	CHNB									
	TLWG									

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
DRNG	BAR	N-E								
	POOL									
	CHNB									
	TLWG									
	ITIP									
ISB	BAR	0.5 (0.3-1.3)		0.37 (0.37-0.37)		16.6 (5.6-28.1)		59 (27-270)		
	POOL									
	CHNB	2.7 (1.1-6.7)	3.1 (1.4-6.7)	0.63 (0.11-1.2)	0.64 (0.27-1.2)	18.7 (5.6-26.8)	16.3 (5.6-25.2)	107 (31-668)	78 (47-168)	10
	TLWG									
	ITIP									
OSB	BAR	0.5 (0.4-0.6)				15.8 (9.9-27.1)		52 (43-67)		
	POOL									
	CHNB	3.9 (0.4-8.9)	4.3 (3.6-6.1)	0.71 (0.02-1.46)	0.57 (0.44-0.77)	18.9 (5.6-27.1)	20.3 (9.9-22.9)	102 (30-690)	46 (39-60)	5
	TLWG									
	ITIP									
SCCL	BAR	0.5 (0.3-0.6)				23.7 (10.6-28.1)		43 (27-68)		
	POOL									
	CHNB	1.5 (1.2-2.1)		0.57 (0.36-0.83)		21.8 (17.2-26.1)		196 (49-659)		
	TLWG									
	ITIP	1.6 (0.3-4.4)		0.59 (0.38-0.85)		22.9 (17.2-27)		95 (26-689)		
SCCS	BAR	0.5 (0.4-0.6)				19.4 (9.6-27.1)		64 (31-130)		
	POOL									
	CHNB									
	TLWG									
	ITIP	1.8 (0.3-4.6)	3.6 (3.3-3.7)	0.55 (0.2-0.74)	0.47 (0.47-0.47)	22.7 (9.6-28.7)	22.2 (22.2-22.3)	79 (44-178)	66 (66-66)	3

Table 3 (continued).

Macro-	Meso-	Depth (m) (Effort)	Depth (m) (Catch)	Bottom Velocity (m/s) (Effort)	Bottom Velocity (m/s) (Catch)	Temp. °C (Effort)	Temp. °C (Catch)	Turbidity (ntu) (Effort)	Turbidity (ntu) (Catch)	Total Pallids caught
SCCN	BAR	0.6 (0.4-0.8)				16.9 (7.4-26.1)		36 (19-62)		
	POOL									
	CHNB									
	TLWG									
	ITIP									
TRIB	BAR									
	POOL									
	CHNB									
	TLWG									
	ITIP									
TRML	BAR									
	POOL									
	CHNB									
	TLWG									
	ITIP									
TRMS	BAR	0.4 (0.4-0.4)				26.8 (26.7-26.8)		97 (97-97)		
	POOL									
	CHNB									
	TLWG									
	ITIP									
WILD	BAR									
	POOL									
	CHNB									
	TLWG									
	ITIP									

Table 6. Mean fork length, weight, relative condition factor (Kn), growth rates, and water temperature for hatchery-reared pallid sturgeon captures by year class at the time of stocking and recapture during 2006 from segment 4 of the Missouri River. Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993). Standard error (+/- 2SE) was calculated where N>1 and is represented on second line of each year.

Year class	N	Stock Data			Recapture Data			Growth Data	
		Length (mm)	Weight (g)	Kn	Length (mm)	Weight (g)	Kn	Length (mm/d)	Weight (g/d)
1997	4	--	--	--	563	607.5	0.846	--	--
		--	--	--	27	65.5	0.055	--	--
2001	3	260	--		422	233.3	0.876	0.105	--
		--	--		19	35.3	0.246	--	--
2002	6	287	74	1.212	405	212.3	0.891	0.109	0.05
		20	14	0.079	23	36.4	0.069	0.023	0.185
2003	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--
2004	2	--	--	--	334	147.5	1.16	--	--
		--	--	--	70	85	0.131	--	--
2005	4	288	--	--	289	93.8	1.143	0.353	--
		16	--	--	60	49.9	0.163	0.317	--
2006	--	--	--	--	--	--	--	--	--
		--	--	--	--	--	--	--	--

Table 7. Incremental relative stock density (RSD)<sup>a</sup> and relative condition factor (Kn) for all pallid sturgeon captured with all gear by a length category during 2005-2006 in the Missouri River. Length categories<sup>b</sup> determined using the methods proposed by Shuman et al. (2006). Relative condition factor was calculated using the equation in Keenlyne and Evanson (1993).

Length Category	N	RSD	Kn (+/- 2SE)
<b>Sturgeon Season</b>			
Sub-stock (0-199)	1	--	1.187
Sub-stock (200-329)	4	--	0.842 (0.059)
Stock	0	--	--
Quality	0	--	--
Preferred	0	--	--
Memorable	0	--	--
Trophy	0	--	--
Overall Kn			0.911 (0.145)
<b>Fish Community Season</b>			
Sub-stock (0-199)	0	--	--
Sub-stock (200-329)	4	--	1.214 (0.177)
Stock	13	81	0.942 (0.075)
Quality	0	--	--
Preferred	1	6	1.065
Memorable	0	0	--
Trophy	2	13	1.039 (0.128)
Overall Kn			1.013 (0.073)

<sup>a</sup> RSD = (# of fish of a specified length class / # of fish  $\geq$  minimum stock length fish) \* 100.

<sup>b</sup> Length categories based on the percentage of the largest known pallid sturgeon: Sub-stock FL < 330 mm (20 %), Stock FL = 330 - 629 mm (20 - 36 %), Quality FL = 630 - 839 mm (36 - 45 %), Preferred FL = 840 - 1039 mm (45 - 59 %), Memorable FL = 1040 - 1269 mm (59 - 74 %), Trophy FL > 1270 mm (>74 %).

### *Year comparisons, Gear evaluation and Habitat associations*

Sampling efforts during the 2006 sturgeon season resulted in the capture of seven pallid sturgeon. Eighteen pallids were collected during fish community season. The previous year's sturgeon season sampling resulted in two pallid captures, while 29 were sampled during the fish community season. In 2006, we captured 22 hatchery stocked and three wild pallid sturgeon. Trammel nets accounted for 18 (72%) of these pallids, with seven (28%) captured with the otter trawl. The 2005 sampling resulted in the capture of 25 hatchery stocked and six wild pallid sturgeon, with trammel nets accounting for 24 (77%) of these captures, while the remaining seven (23%) were sampled using the otter trawl. Catch per unit effort (CPUE) for 2006 was greatest for both hatchery and wild pallids in trammel nets during the fish community season (0.04 and 0.02 per 100 m, respectively). In 2005, CPUE of hatchery and wild pallid sturgeon was greatest using trammel nets during the fish community season (0.062 and 0.012, respectively). Otter trawls had similar results for the fish community season in 2006 as in 2005. Catch per unit effort for hatchery pallid sturgeon using the otter trawl during the 2006 fish community season was 0.021 fish/100 m, while in 2005 the CPUE was 0.02 fish/100m. Catch per unit effort for wild pallid sturgeon in the otter trawl was the same in 2005 and 2006 (0.004 fish per 100 m) (Figures 2-7). Mini-fyke nets and beam trawls did not catch any pallid sturgeon during the fish community season.

All 27 pallid sturgeon captured in 2006 were the result of random sampling in random bends. Two pallids were collected while sampling the first random bend in the Yellowstone River. In 2006, pallid sturgeon were sampled in 11 of the 12 random bends (Figure 1b). During 2005 sampling, pallids were captured in 13 of 14 bends (including two nonrandom bends). In 2006, most pallid sturgeon (N=10) were captured on inside bend macrohabitats, followed by channel crossovers (N=8), outside bends (N=4), and small secondary channels (N=3). The majority of pallids were found in channel border mesohabitats (N=21) followed by island tips (N=3) (Tables 9-16).

The habitat conditions in this segment are extremely variable and diverse. The turbidity experienced from the sampled macrohabitats ranged from 19 to 690 nephelometric turbidity units (ntu), while the turbidity during captures of pallid sturgeon ranged from 26 to 168 ntu.

Water velocities also varied with measured velocities ranging from 0.02 to 1.46 meters/second (m/s), while pallid captures experienced water velocities that ranged from 0.27 to 1.2 m/s. This segment of the monitoring effort experiences significant swings in temperature (5.6-28.1° C). Pallids were captured at a range of temperatures from 5.6 to 25.2° Celsius. Measured depths at the point of capture for pallid sturgeon ranged from 1.4 to 6.7 meters (m). (Table 3)

## Segment 4 - Pallid Sturgeon / Sturgeon Season

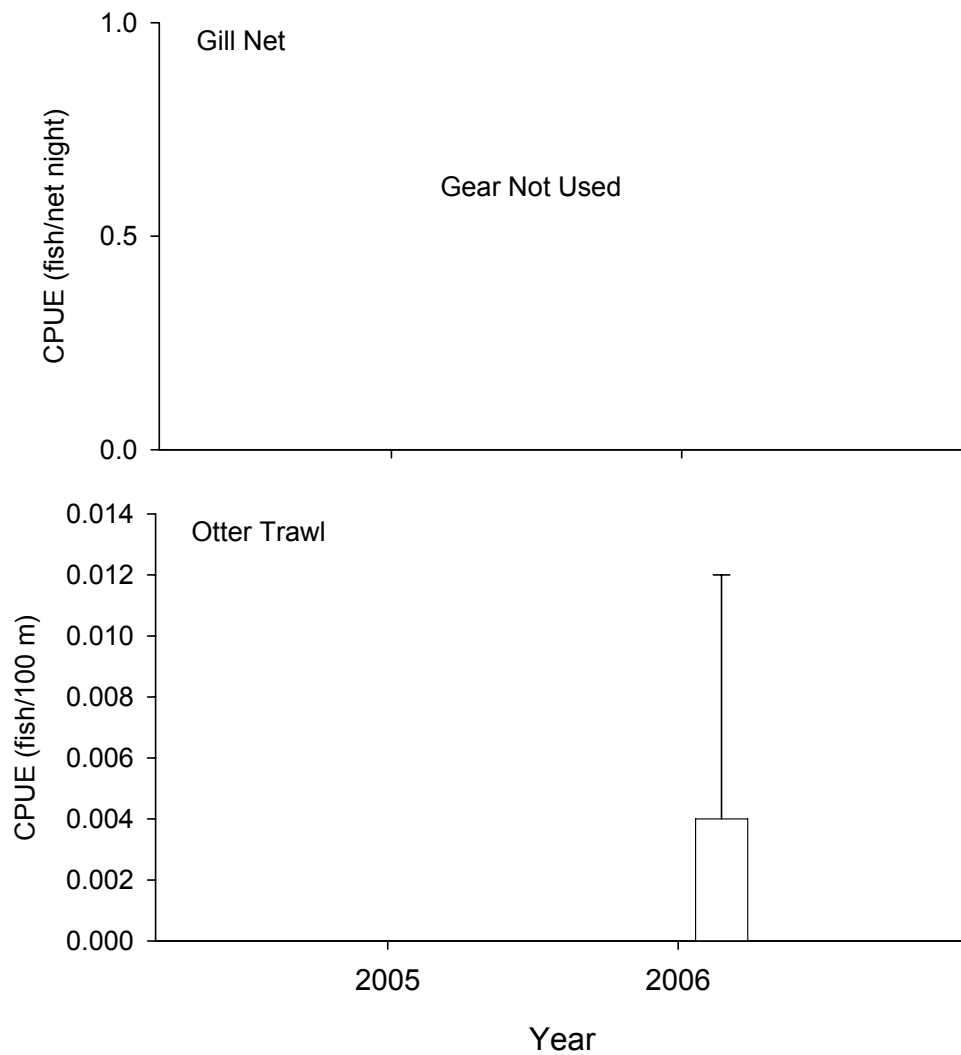


Figure 2. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

### Segment 4 - Pallid Sturgeon / Sturgeon Season

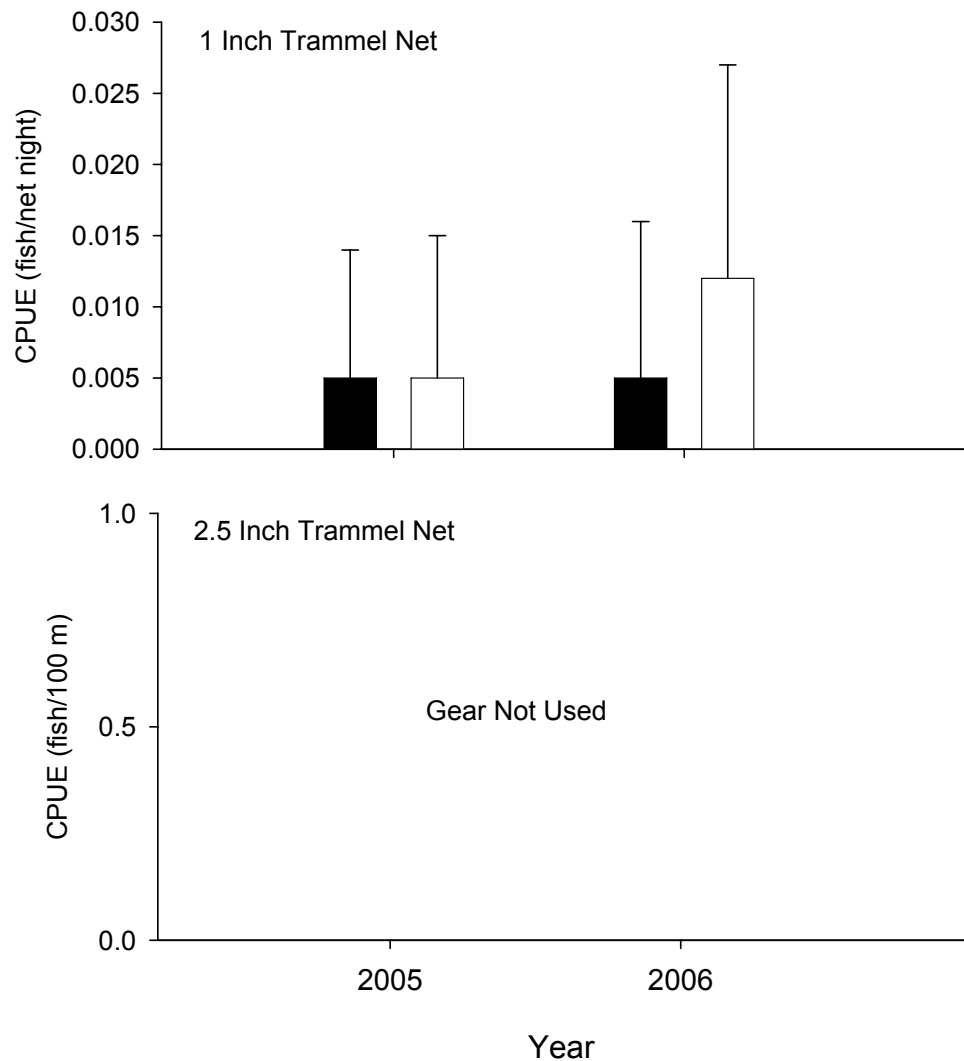


Figure 3. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

## Segment 4 - Pallid Sturgeon / Sturgeon Season

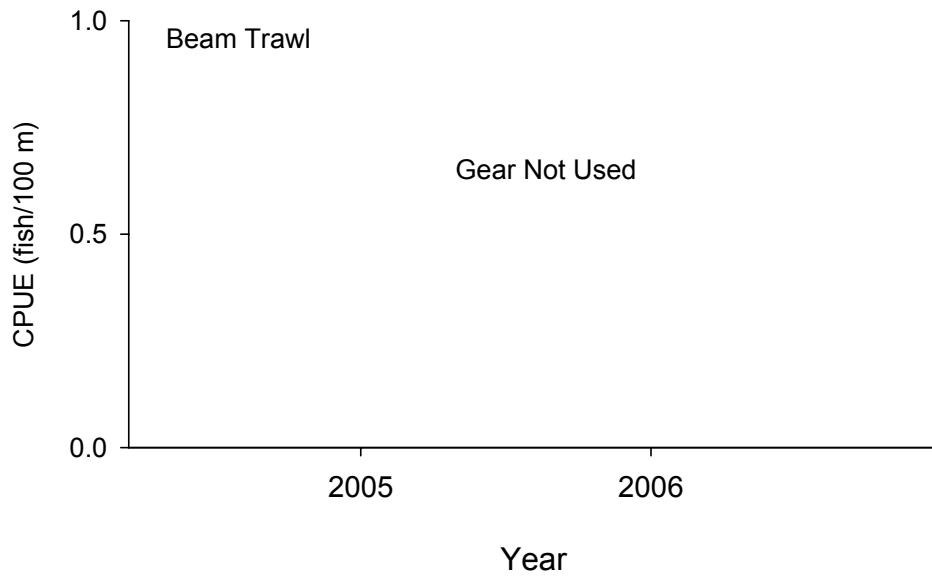


Figure 4. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using beam trawls in segment 4 of the Missouri River during sturgeon season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

## Segment 4 - Pallid Sturgeon / Fish Community Season

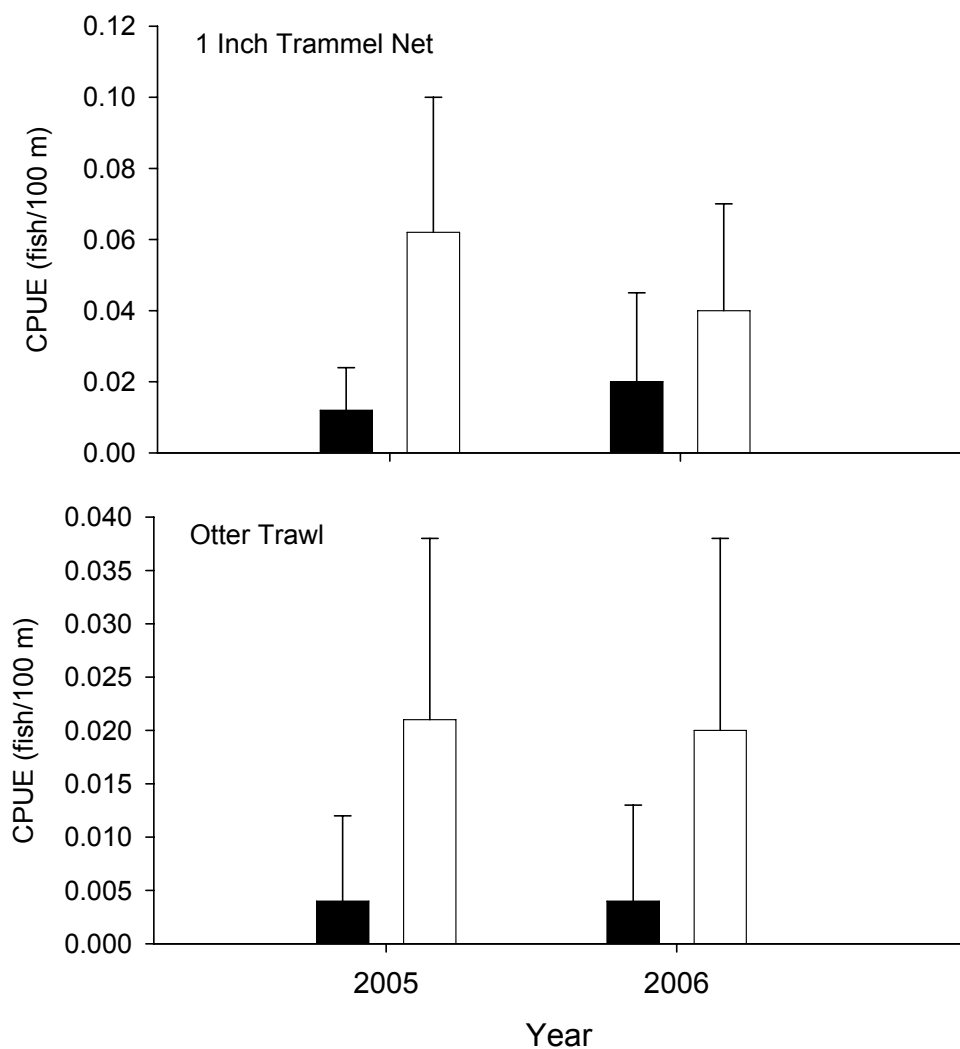


Figure 5. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using 1 inch trammel nets and otter trawls in segment 4 of the Missouri River during fish community season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

## Segment 4 - Pallid Sturgeon / Fish Community Season

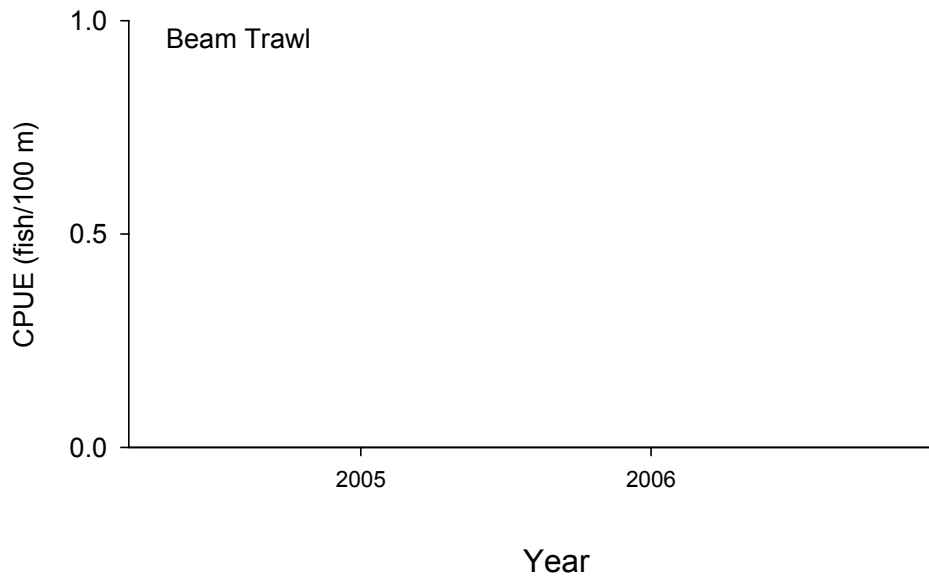


Figure 6. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using beam trawls in segment 4 of the Missouri River during fish community season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

## Segment 4 - Pallid Sturgeon / Fish Community Season

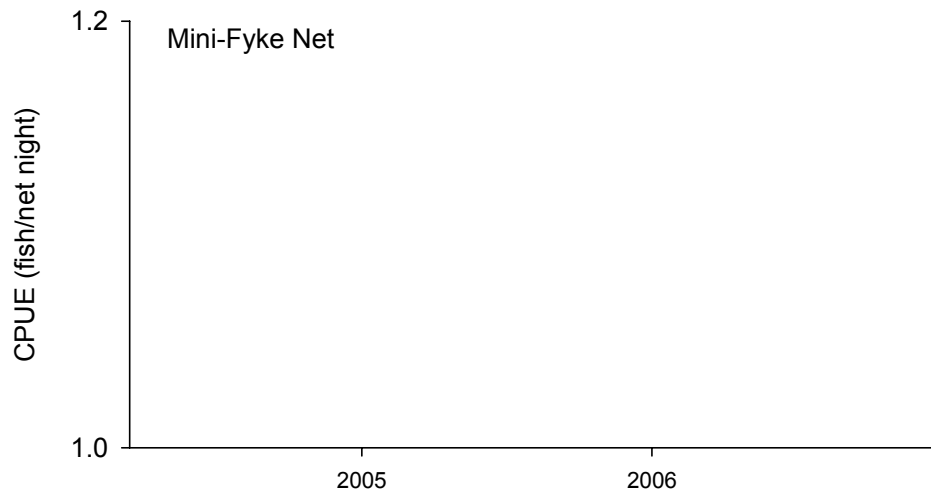


Figure 7. Mean annual catch-per-unit-effort ( $\pm 2$  SE) of wild (black bars) and hatchery reared (white bars) pallid sturgeon using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005-2006. All pallid sturgeon that were captured with no evidence of previously being tagged were deemed wild pending genetic verification.

Table 9. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (1)	0 (0)
Otter Trawl	0	N-E	0 (28)	0 (0)	N-E	N-E	0 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 10. Total number of sub-stock size (0-199 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	0	-	-	-	N-E	N-E
Beam Trawl	0	-	-	-	N-E	N-E
Gill Net	0	-	-	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E

Table 11. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 - 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	1	N-E	0 (27)	0 (0)	N-E	N-E	100 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	2	N-E	50 (24)	0 (0)	N-E	N-E	50 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (1)	0 (0)
Otter Trawl	3	N-E	100 (28)	0 (0)	N-E	N-E	0 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 12. Total number of sub-stock size (200-329 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 - 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	1	0 (0)	100 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	0	-	-	-	N-E	N-E
Beam Trawl	0	-	-	-	N-E	N-E
Gill Net	0	-	-	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	2	0 (1)	100 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	3	0 (0)	100 (96)	0 (4)	N-E	N-E

Table 13. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	3	N-E	0 (27)	0 (0)	N-E	N-E	100 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	1	N-E	0 (26)	0 (0)	N-E	N-E	100 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	9	N-E	11 (24)	0 (0)	N-E	N-E	22 (32)	33 (30)	0 (4)	33 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (1)	0 (0)
Otter Trawl	3	N-E	33 (28)	0 (0)	N-E	N-E	33 (34)	33 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 14. Total number of stock size (330-629 mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	3	0 (0)	100 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	0	-	-	-	N-E	N-E
Beam Trawl	0	-	-	-	N-E	N-E
Gill Net	0	-	-	-	N-E	N-E
Otter Trawl	1	100 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	9	0 (1)	67 (86)	33 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	3	0 (0)	100 (96)	0 (4)	N-E	N-E

Table 15. Total number of quality size and greater ( $\geq 630$  mm) pallid sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Beam Trawl	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Gill Net	0	N-E	-	-	N-E	N-E	-	-	-	-	-	-	-	-	-
Otter Trawl	0	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	2	N-E	50 (24)	0 (0)	N-E	N-E	50 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (1)	0 (0)
Otter Trawl	1	N-E	100 (28)	0 (0)	N-E	N-E	0 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 16. Total number of quality size and greater ( $\geq 630$  mm) pallid sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 7. N-E indicates the habitat is non-existent in the segment.

the segment.						
Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	0	-	-	-	N-E	N-E
Beam Trawl	0	-	-	-	N-E	N-E
Gill Net	0	-	-	-	N-E	N-E
Otter Trawl	0	0 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	2	0 (1)	100 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	1	0 (0)	100 (96)	0 (4)	N-E	N-E

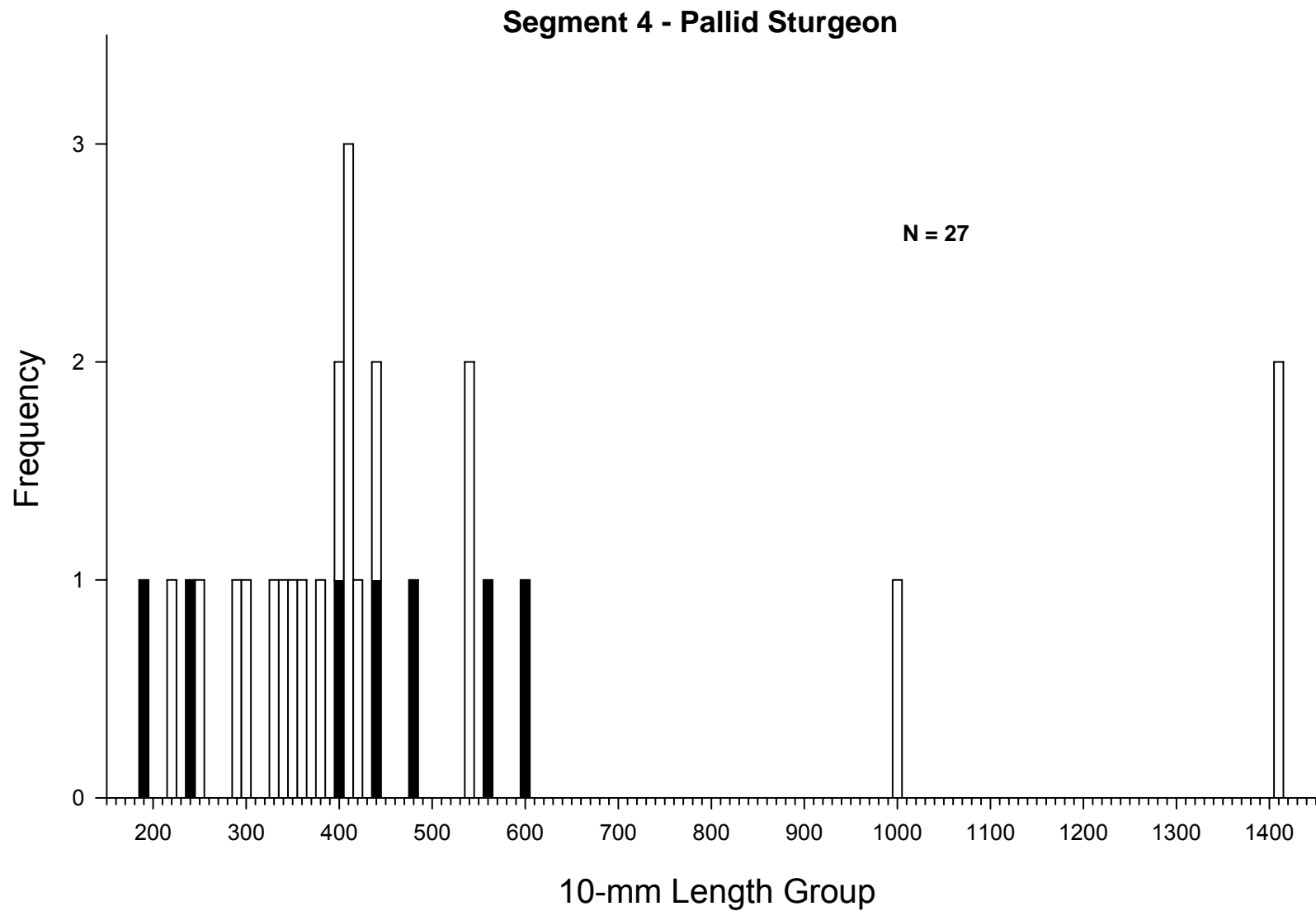


Figure 8. Length frequency of pallid sturgeon captured during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006 including non-random and wild samples.

#### Segment 4 - Annual Pallid Sturgeon Capture History

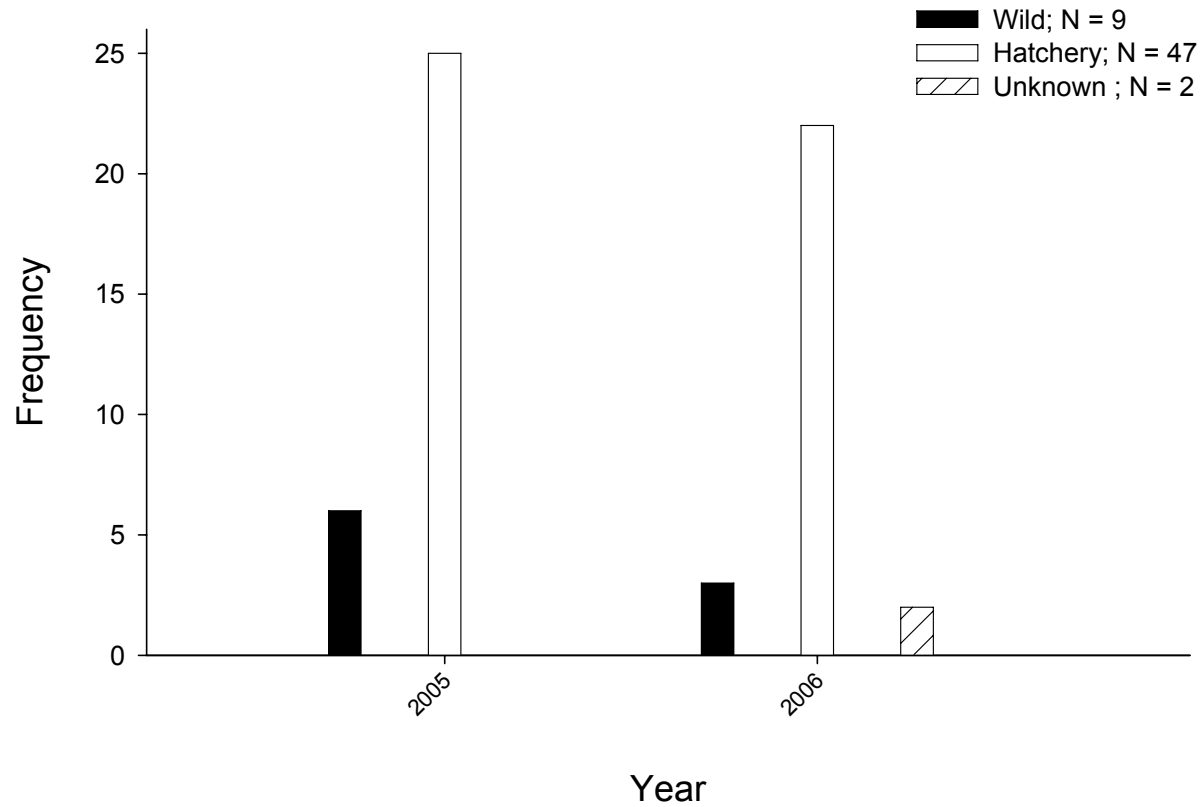


Figure 9. Annual capture history of wild (black bars) and hatchery reared (white bars) pallid sturgeon collected in segment 4 of the Missouri River from 2005 to 2006. Figure is designed to compare overall pallid sturgeon captures from year to year and may be biased by variable effort between years.

### **Shovelnose X Pallid Sturgeon Hybrids**

No shovelnose x pallid sturgeon hybrids were sampled during 2006.

## **Shovelnose Sturgeon**

A total of 415 shovelnose sturgeon were captured in segment 4 for the sampling conducted during the 2006 sturgeon and fish community seasons. The standard trammel net accounted for 298 (71%) of the captured shovelnose, with 91 (22%) captured with the otter trawl, and 26 (7%) captured in the beam trawl.

Catch per unit effort of substock size class (FL 150-249 mm) shovelnose sturgeon in trammel nets during the sturgeon season in 2006 was 0.015 fish/100 m. During the 2005 sturgeon season, there were no substock size shovelnose sturgeon sampled. Stock size (FL 250-379 mm) CPUE was 0.044 fish/100 m in 2006 compared to 0.032 fish/100 m in the 2005 sturgeon season. The CPUE for quality and above shovelnose sturgeon during the 2005 sturgeon season was 0.042 fish/100 m, whereas during the 2006 sturgeon season the CPUE for quality and above was 0.069 fish/100 m (Figure 12).

During the 2006 fish community season, the CPUE of substock (FL 150-249mm) shovelnose in trammel nets was 0.024 fish/100 m. Catch per unit effort of the same size class last year was 0.01 fish/100 m. Stock size (FL 250-379 mm) shovelnose were captured at a rate of 0.141 and 0.071 fish per 100 m during the 2006 and 2005 fish community season, respectively. Quality size and greater (FL>380 mm) catch of shovelnose in 2006 was 0.213 fish/100 m. During the 2005 fish community season, CPUE of quality and greater shovelnose sturgeon in trammel nets was 0.173 fish/100 m (Figure 14).

The otter trawl was not deployed during the 2005 sturgeon season, but in 2006 it was used in all twelve random bends during the sturgeon season. The CPUE of substock (FL 0-149 mm) and substock (FL 150-249 mm) in the otter trawl was 0.004 and 0.079 fish/100 m, respectively. Catch per unit effort of stock size shovelnose sturgeon in the otter trawl during the sturgeon season was 0.019 fish /100 m. Quality and above size class CPUE effort was 0.047 fish/100 m (Figure 11).

Catch per unit effort of shovelnose sturgeon in the otter trawl during fish community was higher for two size classes in 2006 than 2005. Catch per unit effort of substock (FL 150-249 mm) and stock size class was 0.025 and 0.046 fish/100 m, respectively, in 2006. During the 2005 fish

community, the CPUE for the same size classes was 0.016 fish/100m for substock and 0.029 fish/100 m for stock. Substock size (FL 0-149 mm) and stock and above size class CPUE during the 2006 fish community season was 0.025 fish/100 m and 0.086 fish/100m, respectively. During the 2005 fish community season, the CPUE for substock size (FL 0-149 mm) shovelnose sturgeon in the otter trawl was 0.198 fish/100m and for stock and above size class it was 0.132 fish/100 m (Figure 14).

The beam trawl was deployed in all twelve random bends during the 2006 fish community season. Catch per unit effort for substock size (FL 0-149 mm) shovelnose was 0.038 fish/100 m and 0.019 fish/100 m for substock size class (FL 150-249 mm). Stock size class CPUE was 0.017 fish/100 m and 0.042 fish/100 m for stock and above size class shovelnose sturgeon (Figure 16).

Fork lengths (FL) of shovelnose sturgeon ranged from 32 – 890 mm for the segment 4 sampling season. Based on length frequency histogram, there appears to be three significant size classes (Figure 17). Although specific age data was not available at the time of this analysis, previous work (Pierce et al., 2003) suggests these size classes are made up of several year classes. Relative Stock Density (RSD) values suggest that recruitment is occurring as fish in all size classes were captured.

## Segment 4 - Shovelnose Sturgeon / Sturgeon Season

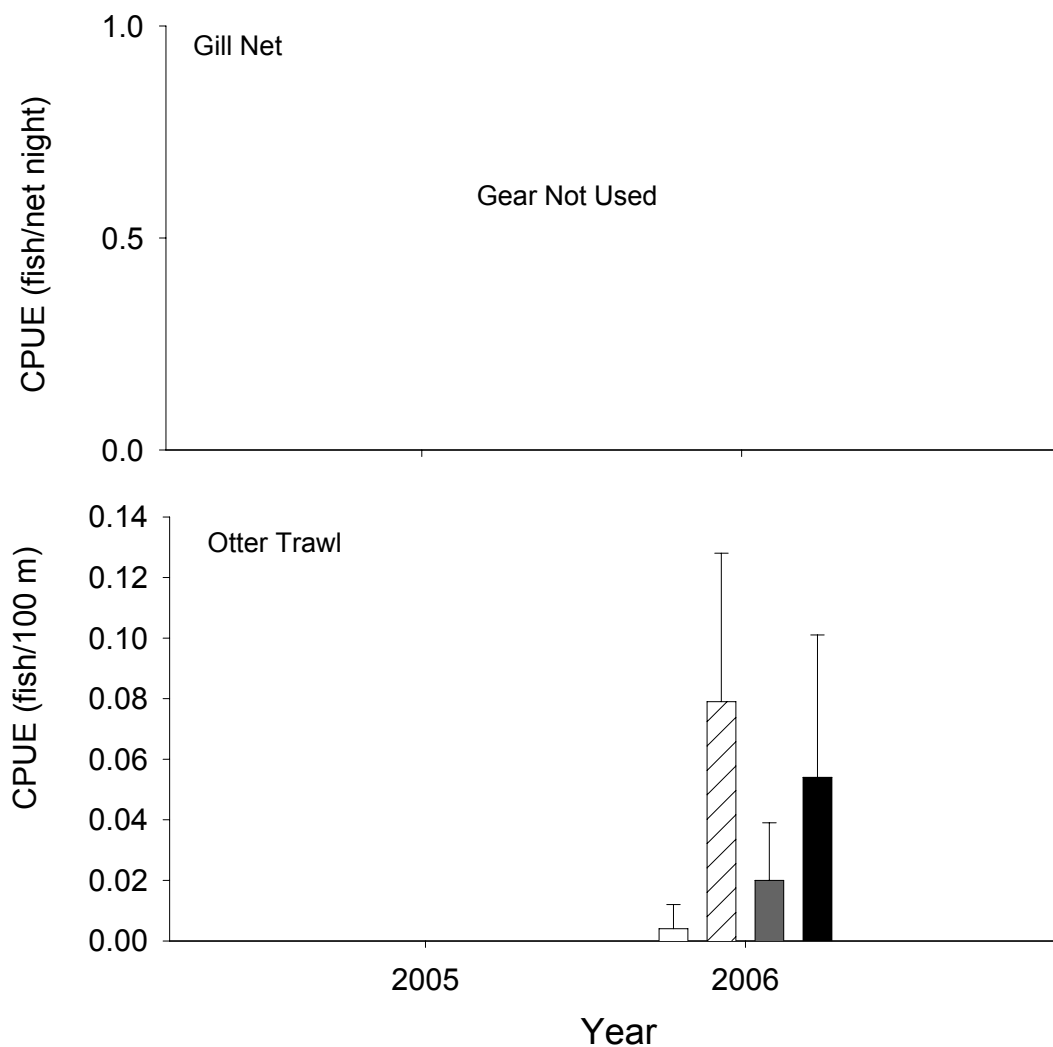


Figure 11. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Shovelnose Sturgeon / Sturgeon Season

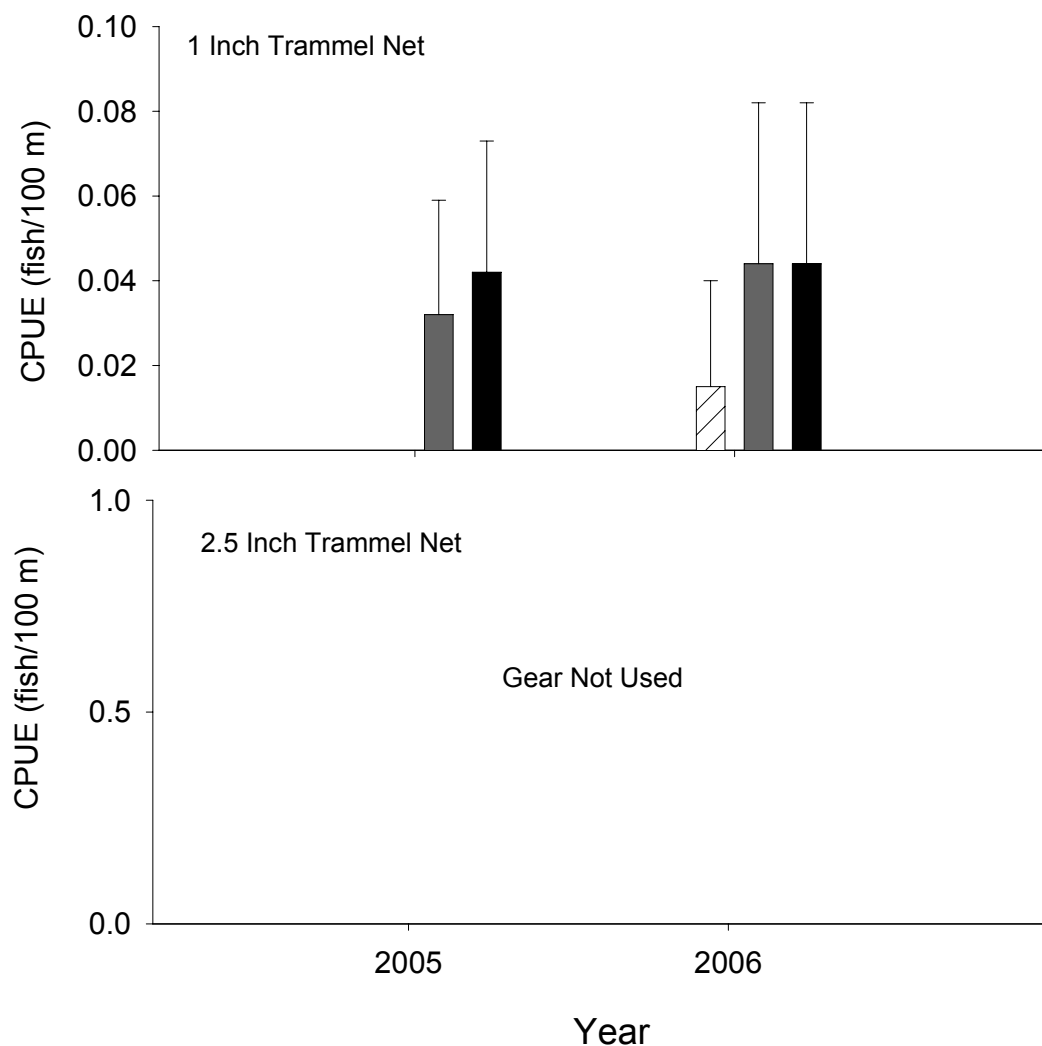


Figure 12. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Shovelnose Sturgeon / Sturgeon Season

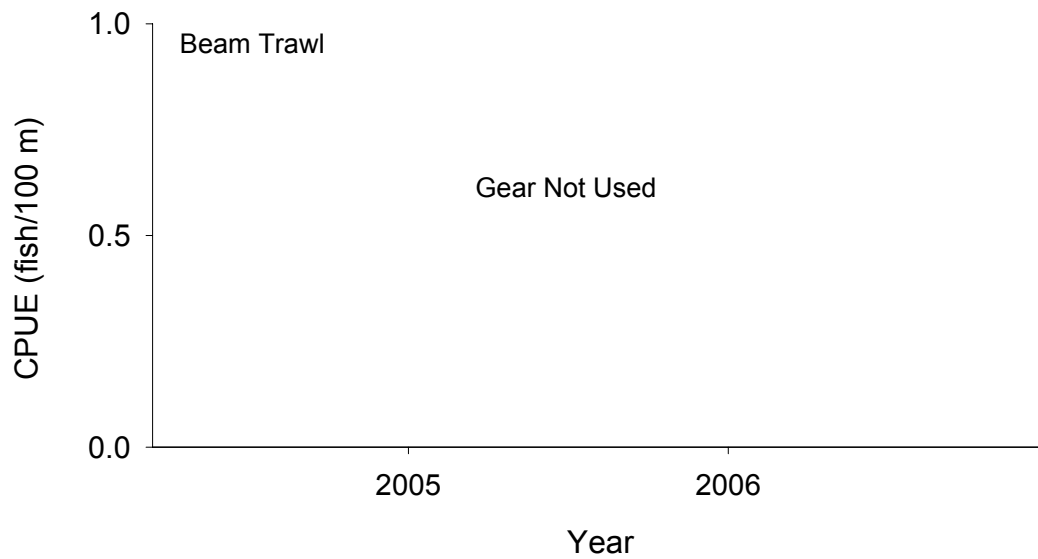


Figure 13. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $>$  380 mm; black bars) shovelnose sturgeon using beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Shovelnose Sturgeon / Fish Community Season

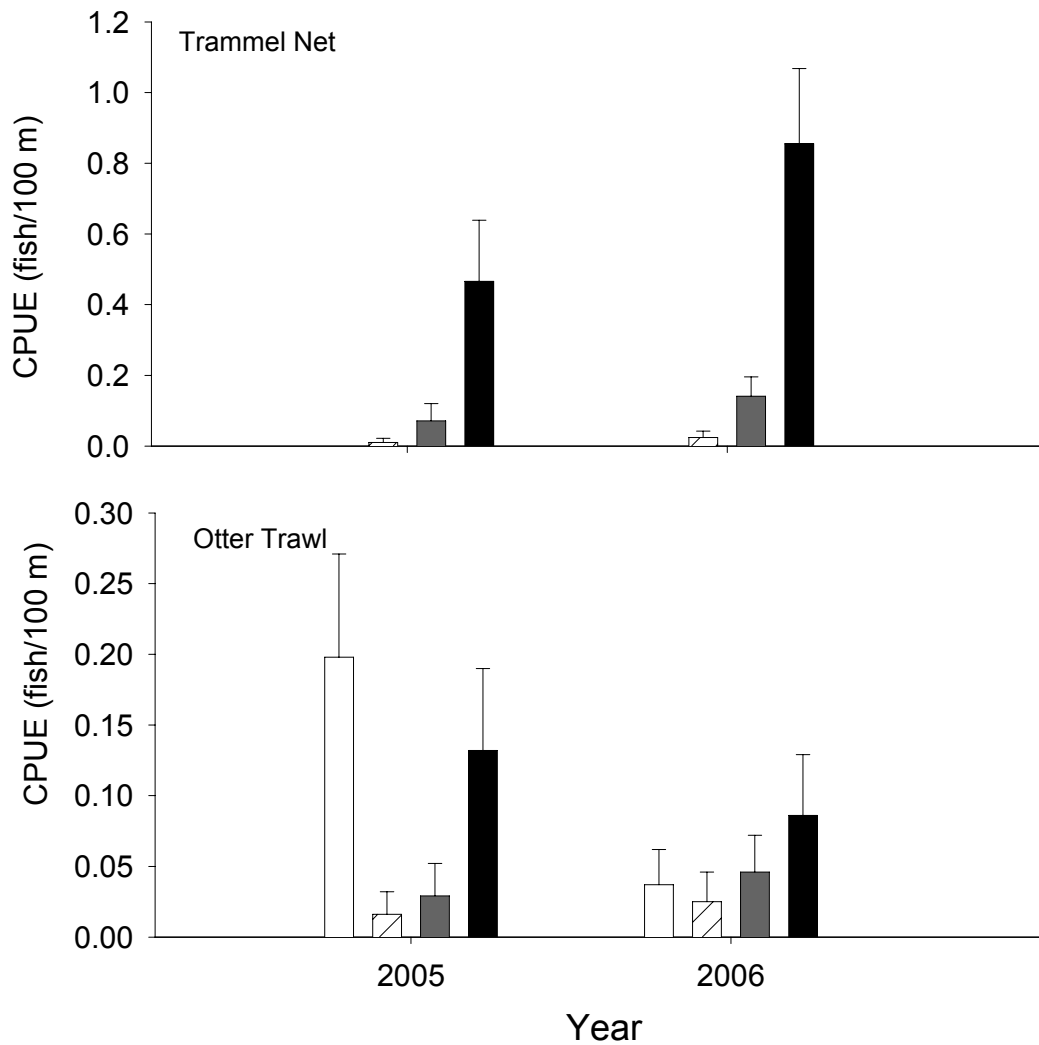


Figure 14. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size ( $> 380$  mm; black bars) shovelnose sturgeon in segment 4 of the Missouri River during fish community season 2005 - 2006.

## Segment 4 - Shovelnose Sturgeon / Fish Community Season

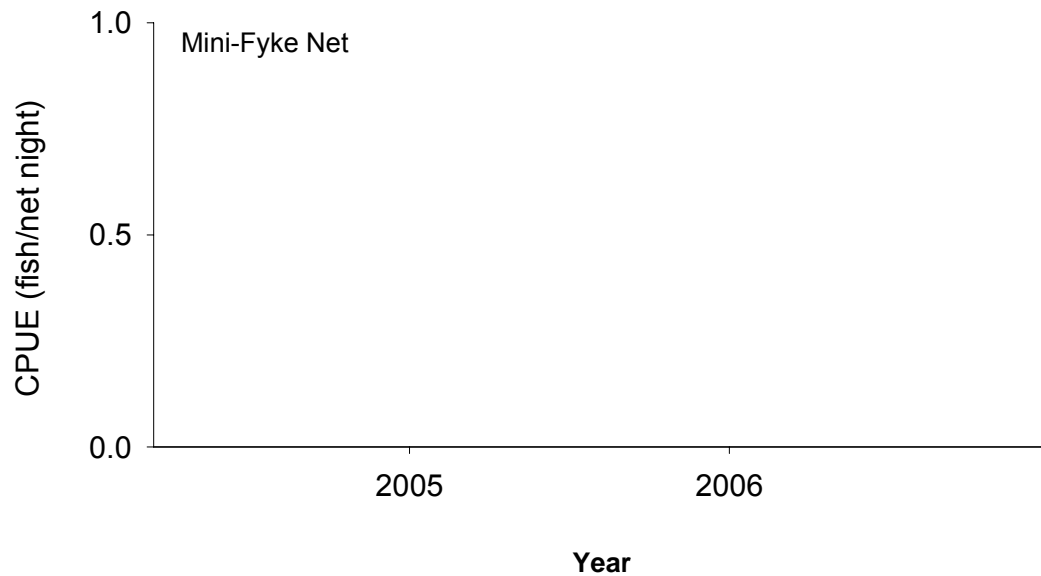


Figure 15. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2005 - 2006.

## Segment 4 - Shovelnose Sturgeon / Fish Community Season

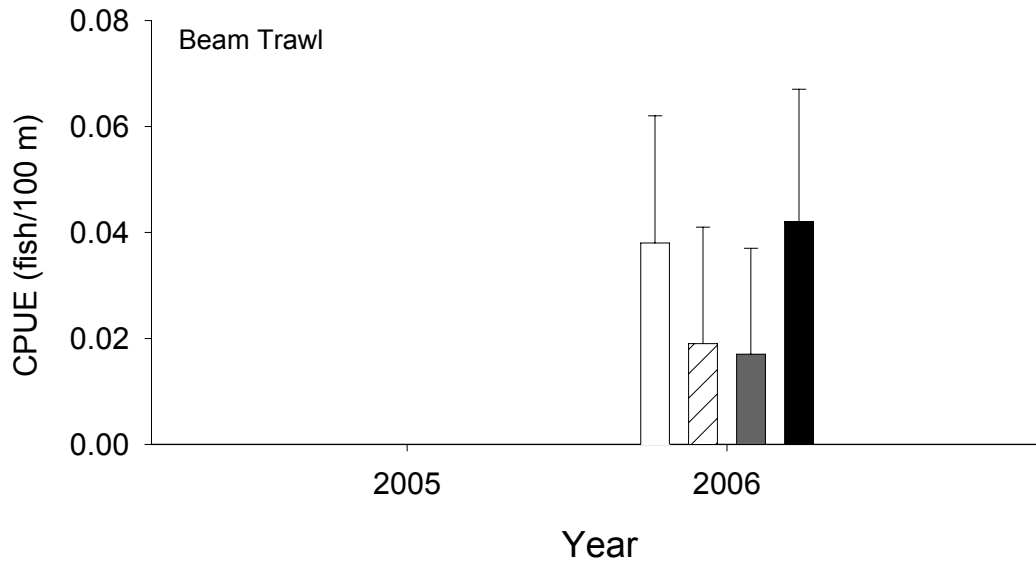


Figure 16. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sub-stock size (0-149 mm; white bars), sub-stock size (150-249 mm; cross-hatched), stock size (250-379 mm; gray bars), and quality and above size (> 380 mm; black bars) shovelnose sturgeon using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.

### *Habitat Use*

Macrohabitats where shovelnose sturgeon were primarily captured included inside and outside bends, channel crossovers, tributary, and large connected secondary channels. For sub-stock sized (0-149 mm) shovelnose (N=21), inside bend and outside bend macrohabitats were dominant habitats where these fish were collected. The sub-stock (150-249) shovelnose (N=38) were sampled in the inside and outside bends, channel crossovers, and large connected secondary channel macrohabitats while the habitats associated with the stock size (250-379 mm) shovelnose (N=62) captures were mainly inside and outside bends. The quality and above size class (>380 mm) shovelnose sturgeon (N=248) were associated with inside and outside bends, channel crossovers, large connected secondary channels, and small connected secondary channels (Tables 17, 19, 21, 23). The mesohabitats associated with shovelnose sturgeon captures were primarily classified as channel border and island tips (Tables 18, 20, 22, 24). Sand substrate dominated the sampling area and is the predominant substrate found within the segment.

Table 17. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	1	N-E	0 (26)	0 (0)	N-E	N-E	100 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	9	N-E	22 (25)	0 (0)	N-E	N-E	56 (35)	22 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	11	N-E	9 (28)	0 (0)	N-E	N-E	64 (34)	27 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 18. Total number of sub-stock size (0-149 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	1	0 (0)	100 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	9	0 (0)	100 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	11	0 (0)	100 (96)	0 (4)	N-E	N-E

Table 19. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	3	N-E	0 (27)	0 (0)	N-E	N-E	100 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	17	N-E	29 (26)	0 (0)	N-E	N-E	29 (33)	12 (27)	12 (9)	18 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	7	N-E	14 (24)	0 (0)	N-E	N-E	29 (32)	57 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	4	N-E	50 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	50 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	7	N-E	0 (28)	0 (0)	N-E	N-E	57 (34)	14 (32)	14 (3)	14 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 20. Total number of sub-stock size (150-249 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	3	0 (0)	100 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	17	0 (0)	82 (91)	18 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	7	0 (1)	100 (86)	0 (13)	N-E	N-E
Beam Trawl	4	0 (0)	100 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	7	0 (0)	86 (96)	14 (4)	N-E	N-E

Table 21. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005– 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	6	N-E	0 (27)	0 (0)	N-E	N-E	33 (38)	33 (30)	33 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	5	N-E	20 (26)	0 (0)	N-E	N-E	20 (33)	20 (27)	20 (9)	20 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	34	N-E	18 (24)	0 (0)	N-E	N-E	41 (32)	35 (30)	3 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	3	N-E	0 (25)	0 (0)	N-E	N-E	33 (35)	33 (34)	33 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	14	N-E	14 (28)	0 (0)	N-E	N-E	57 (34)	29 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 22. Total number of stock size (250-379 mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	6	0 (0)	83 (97)	17 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	5	0 (0)	80 (91)	20 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	34	0 (1)	94 (86)	6 (13)	N-E	N-E
Beam Trawl	3	0 (0)	100 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	14	0 (0)	100 (96)	0 (4)	N-E	N-E

Table 23. Total number of quality size and greater ( $\geq 380$  mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	15	N-E	20 (27)	0 (0)	N-E	N-E	47 (38)	20 (30)	13 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	10	N-E	50 (26)	0 (0)	N-E	N-E	20 (33)	20 (27)	0 (9)	10 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	189	N-E	36 (24)	0 (0)	N-E	N-E	25 (32)	30 (30)	1 (4)	8 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	10	N-E	30 (25)	0 (0)	N-E	N-E	40 (35)	30 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	24	N-E	46 (28)	0 (0)	N-E	N-E	29 (34)	21 (32)	4 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 24. Total number of quality size and greater ( $\geq 380$  mm) shovelnose sturgeon captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. Size categories described in Table 25. N-E indicates the habitat is non-existent in the segment.

Not consistent in the segment.						
Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	15	0 (0)	87 (97)	13 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	10	0 (0)	90 (91)	10 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	189	0 (1)	91 (86)	9 (13)	N-E	N-E
Beam Trawl	10	0 (0)	100 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	24	0 (0)	96 (96)	4 (4)	N-E	N-E

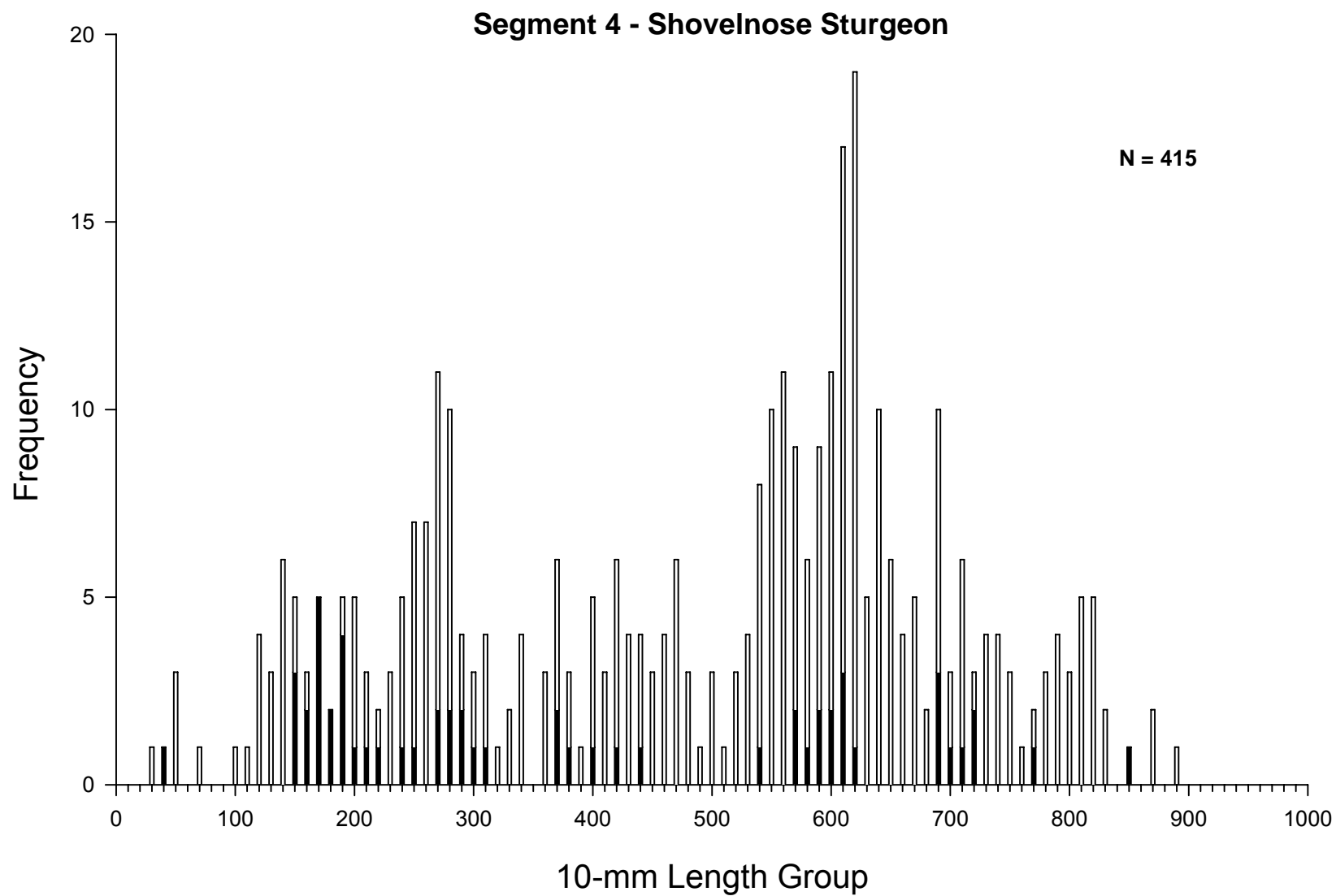


Figure 17. Length frequency of shovelnose sturgeon from fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

Table 25. Incremental relative stock density (RSD)<sup>a</sup> and mean relative weight (Wr) by a length category for shovelnose sturgeon in segment 4 of the Missouri River captured during 2005 – 2006. Length categories<sup>b</sup> determined using methods proposed by Quist (1998).

Length category	N	RSD	Wr (+/- 2SE)
<b>Sturgeon Season</b>			
Sub-stock (0-149 mm)	1	--	
Sub-stock (150-249 mm)	20	--	116.998 (11.265)
Stock	11	31	117.389 (9.544)
Quality	4	11	88.753 (2.293)
Preferred	12	33	96.319 (3.609)
Memorable	8	22	86.71 (6.647)
Trophy	1	3	108.233
Overall Wr	57		106.143 (5.671)
<b>Fish Community Season</b>			
Sub-stock (0-149 mm)	20	--	119.212 (7.507)
Sub-stock (150-249 mm)	18	--	104.974 (5.421)
Stock	51	19	113.856 (9.274)
Quality	42	15	95.247 (5.814)
Preferred	101	37	94.572 (2.25)
Memorable	65	24	93.315 (3.09)
Trophy	15	5	87.157 (11.849)
Overall Wr	312		99.002 (2.376)

<sup>a</sup> RSD = (# of fish of a specified length class / # of fish ≥ minimum stock length fish) \* 100.

<sup>b</sup> Length categories based on the percentage of the largest known shovelnose sturgeon: Sub-stock FL < 250 mm (20 %), Stock FL = 250-379 mm (20 – 36 %), Quality FL = 380 – 509 mm (36 – 45 %), Preferred FL = 510 - 639 mm (45 – 59 %), Memorable FL = 640 – 809 mm (59 – 74 %), Trophy FL > 810 mm (>74 %).

## **Sturgeon Chub**

The highest catch per unit effort for sturgeon chub was with beam trawls (1.09 fish/100 m), followed by otter trawls (0.492 fish/net night) and mini-fyke nets (0.022). Catch per unit effort for sturgeon chub in the otter trawl and mini-fyke nets was higher in 2005 than 2006 (Figures 19 and 20). The majority of fish sampled with the otter trawl were found on inside bend macrohabitats (46%), followed by channel crossovers (26%), outside bends (16%), and large secondary channel macrohabitats (7%) (Table 26). In 2005, sturgeon chubs were more frequently sampled in outside bend macrohabitats (44%), followed by inside bends (24%), channel crossovers (16%), and large secondary channels (15%). Sturgeon chubs were captured more frequently in beam trawls in inside bend macrohabitats (56%), followed by channel crossovers (20%), outside bends (19%), and secondary channels. Only two sturgeon chub were sampled in mini-fyke nets. Fifty (19%) sturgeon chubs captured were in the 25 – 49 mm total length size range. There were 121 (47%) sampled between 50 mm and 74 mm, 40 (16%) between 75 mm and 99 mm, and one (.4%) 100 mm and greater in length (Figure 21). Last year's sampling resulted in 50 (32%) sturgeon chubs collected between the 25 – 49 mm total length size range. There were 67 (43%) sampled between 50 mm and 74 mm, 38 (24%) between 75 mm and 99 mm, and one (.06%) 100 mm and greater in length.

## Segment 4 - Sturgeon Chub / Sturgeon Season

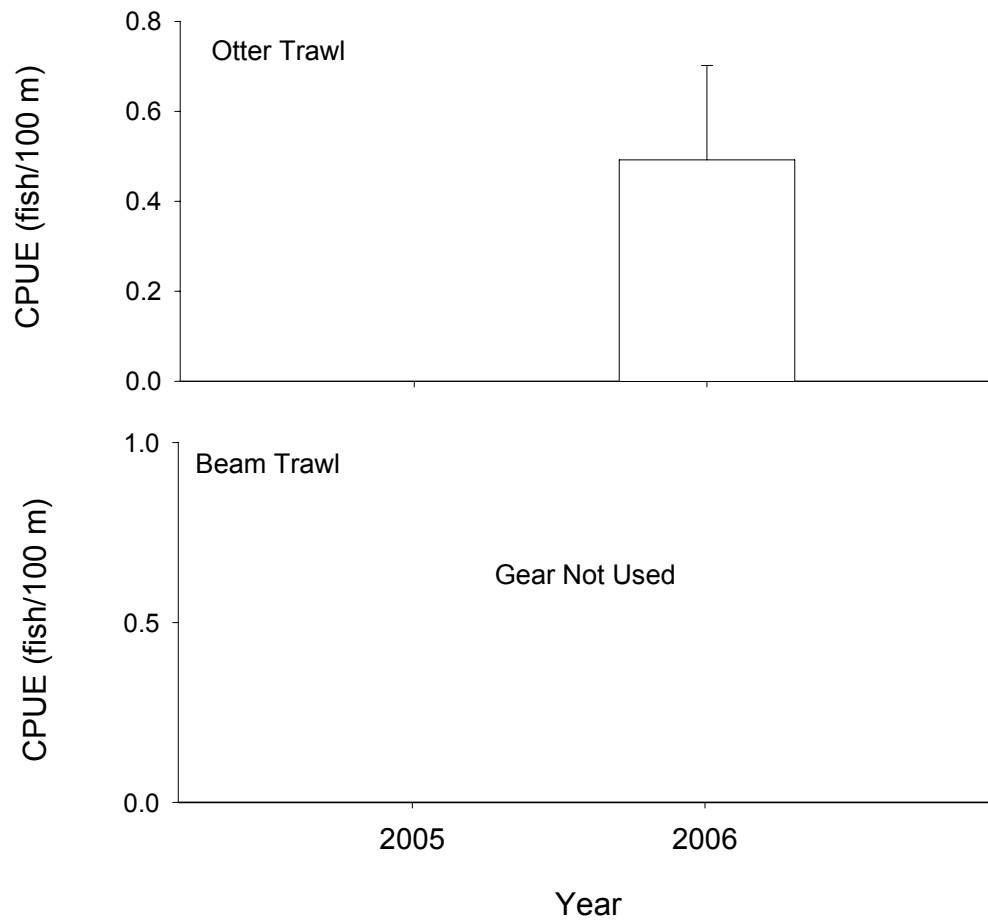


Figure 18. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005-2006.

## Segment 4 - Sturgeon Chub / Fish Community Season

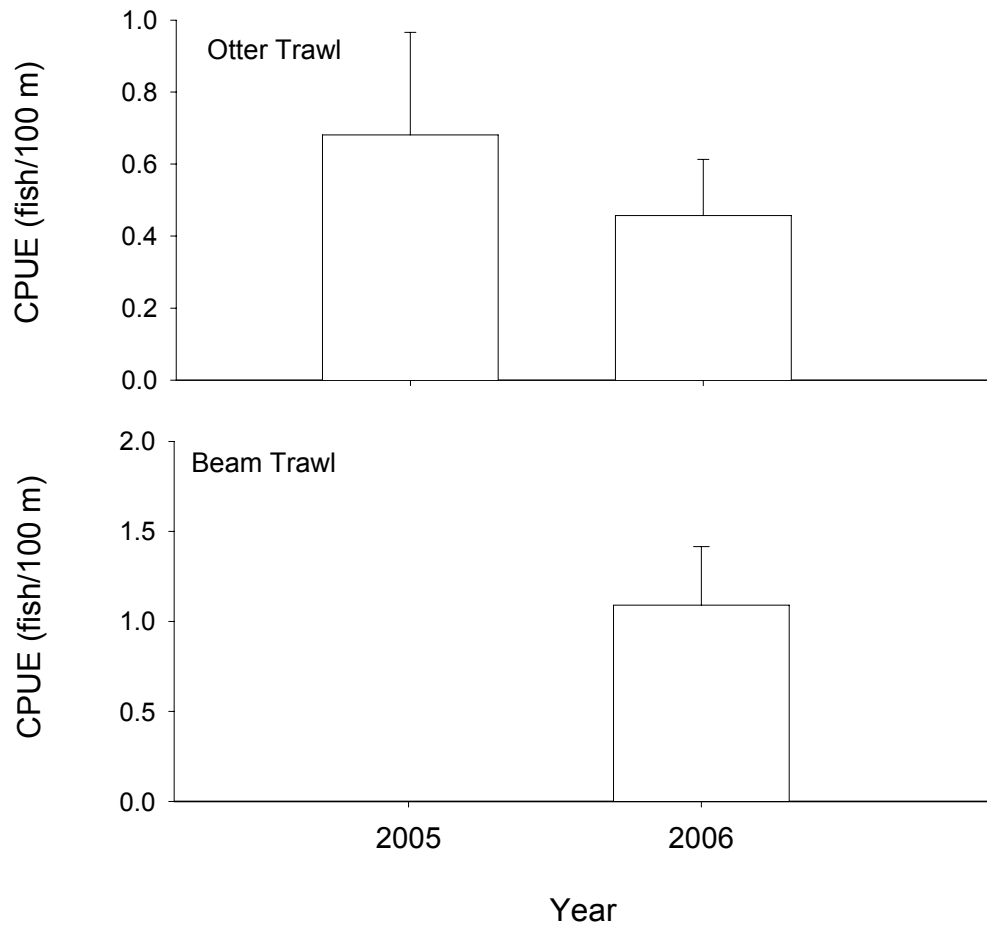


Figure 19. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sturgeon chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005-2006.

#### Segment 4 - Sturgeon Chub / Fish Community Season

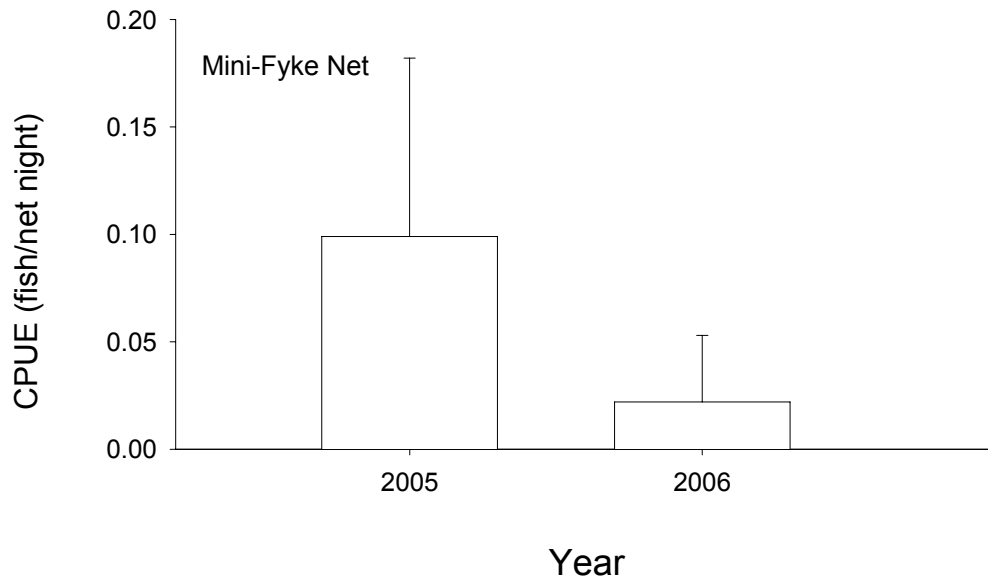


Figure 20. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sturgeon chub using mini-fyke nets and bag seines in segment 4 of the Missouri River during fish community season 2005-2006.

Table 26. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	115	N-E	17 (26)	0 (0)	N-E	N-E	41 (33)	18 (27)	17 (9)	7 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	266	N-E	20 (25)	0 (0)	N-E	N-E	56 (35)	19 (34)	3 (3)	2 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	2	N-E	0 (8)	0 (0)	N-E	N-E	50 (39)	0 (7)	50 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	140	N-E	34 (28)	0 (0)	N-E	N-E	50 (34)	15 (32)	0 (3)	1 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 27. Total number of sturgeon chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	115	0 (0)	87 (91)	13 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	266	0 (0)	96 (96)	4 (4)	N-E	N-E
Mini-Fyke Net	2	100 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	140	0 (0)	99 (96)	1 (4)	N-E	N-E

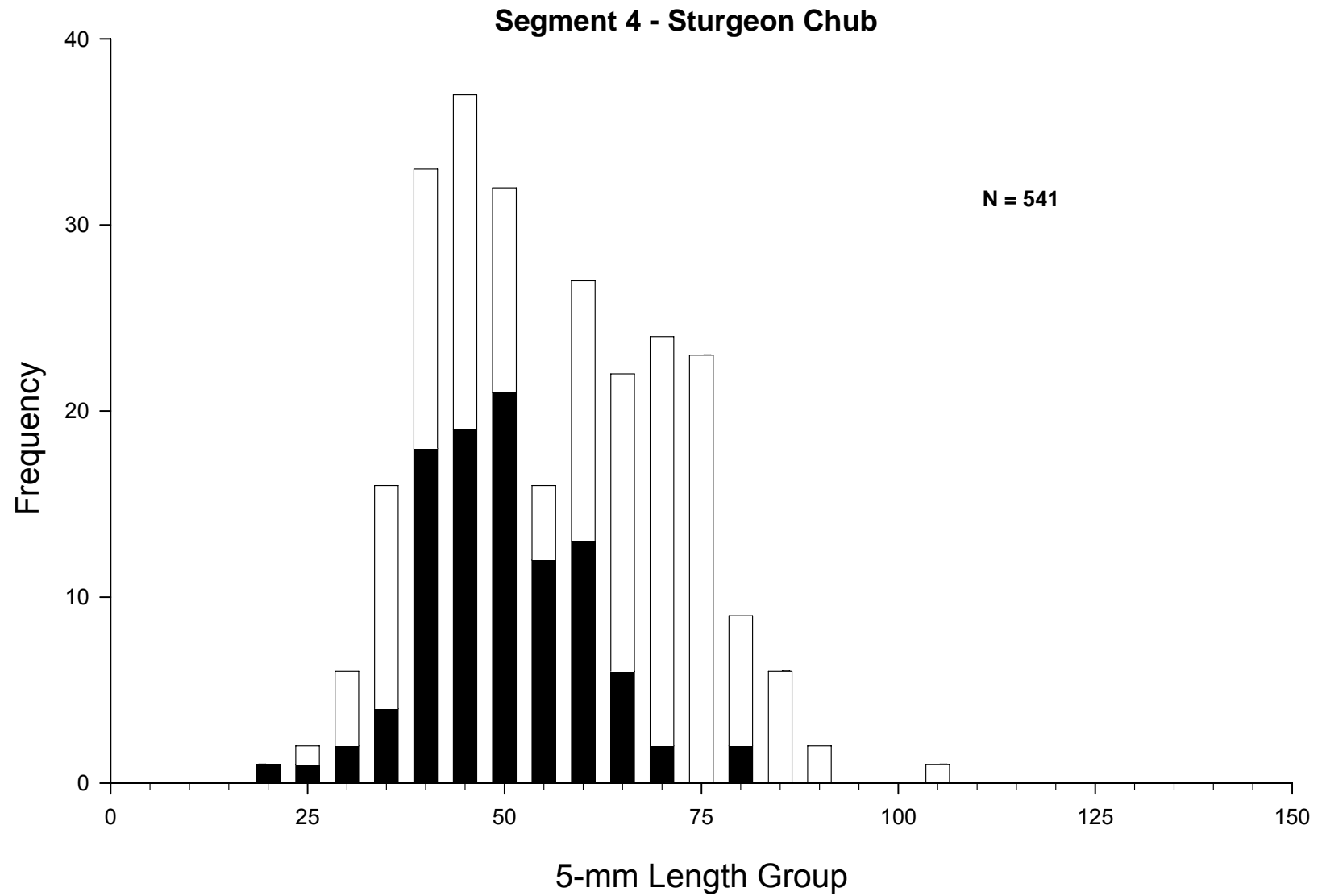


Figure 21. Length frequency of sturgeon chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

## **Sicklefin Chub**

Catch per unit effort was highest for sicklefin chubs in the otter trawl (0.505 fish/100 m) during the fish community season, followed by beam trawls (0.378 fish/100 m) and mini-fyke nets (0.056 fish/net night) (Figures 23 and 24). One hundred (32%) sicklefin chubs were sampled in inside bend macrohabitats followed by 98 (32%) found in outside bends, 76 (25%) collected in channel crossovers, and 23 (7%) found in secondary channel macrohabitats (Table 28). Seven (3%) sturgeon chub were captured that were under 40 mm total length. Four (2%) were between 40-59 mm, 145 (65%) were between 60-79 mm total length, 60 (27%) were in the 80-999 mm size range, and four (2%) were above 100 mm in total length (Figure 25). In 2005, thirty two (10%) sicklefin chubs captured were in the 40 – 59 mm total length size range. There were 200 (67%) sampled between 60 mm and 79 mm, 52 (17%) between 80 mm and 99 mm, and 13 (4%) 100 mm and greater in length.

## Segment 4 - Sicklefin Chub / Sturgeon Season

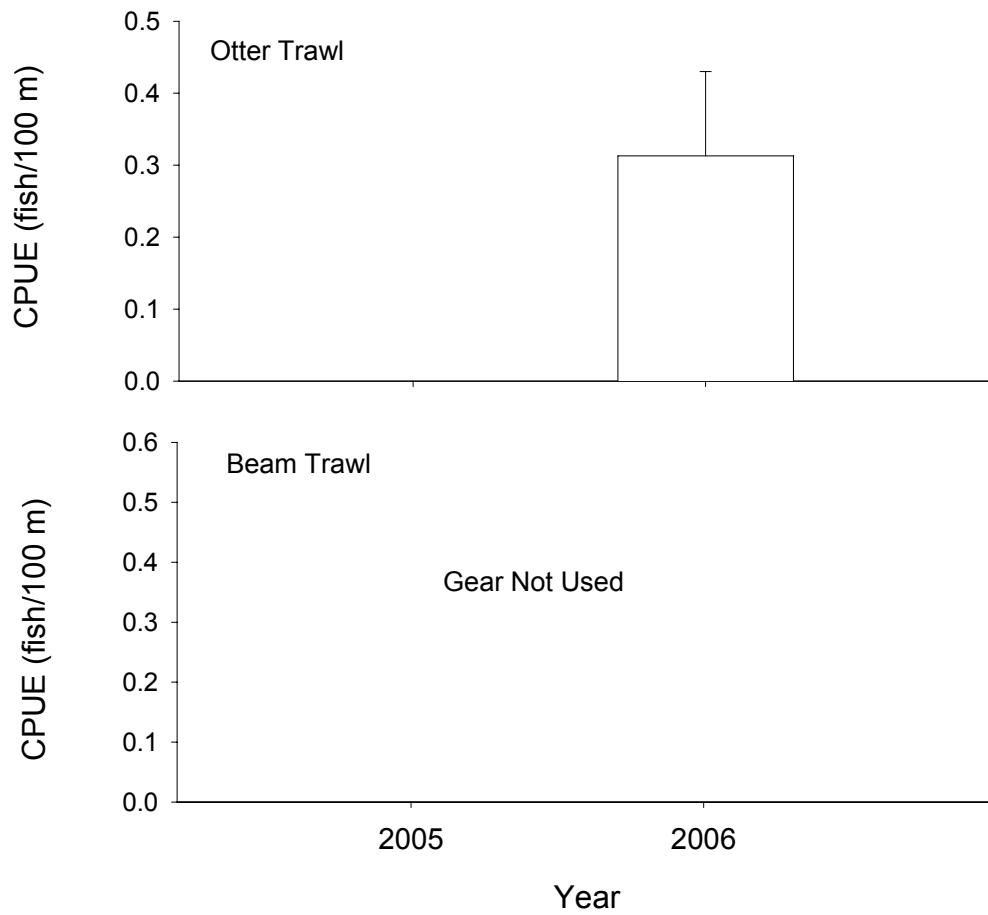


Figure 22. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005-2006.

## Segment 4 - Sicklefin Chub / Fish Community Season

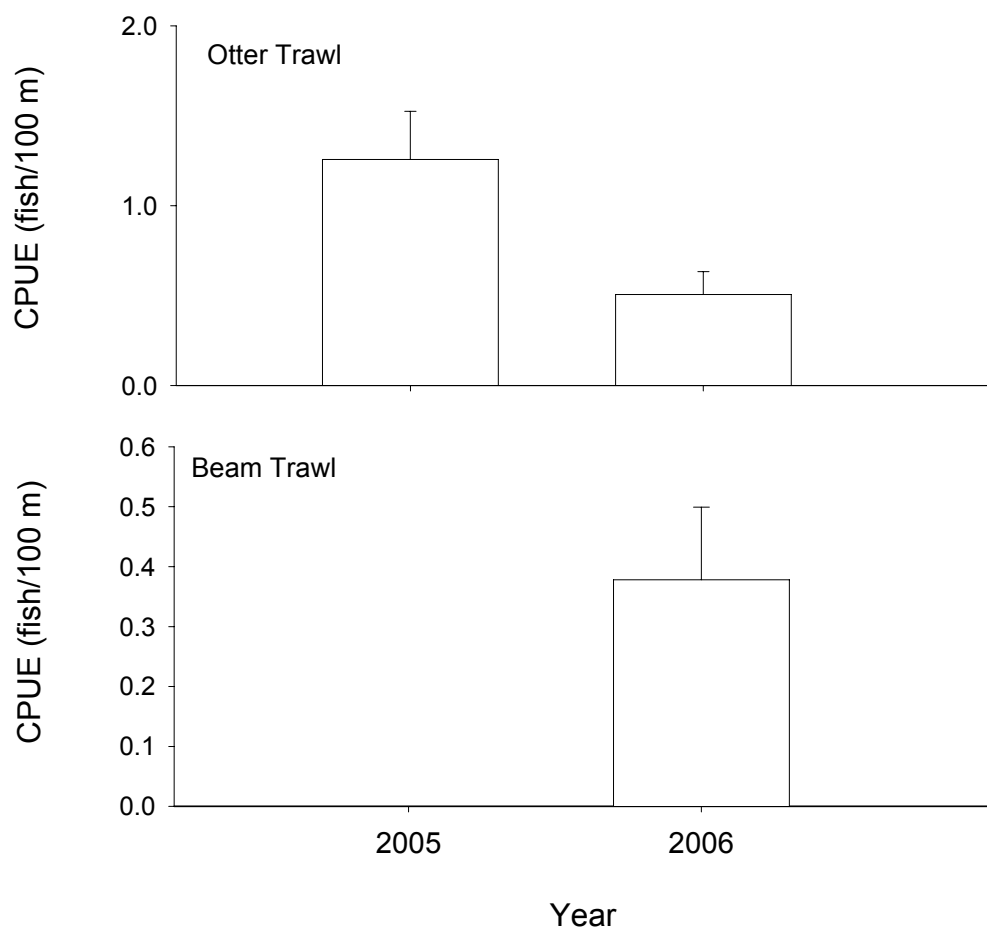


Figure 23. Mean annual catch-per-unit-effort ( $\pm 2$ SE) of sicklefin chub using otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005-2006.

## Segment 4 - Sicklefin Chub / Fish Community Season

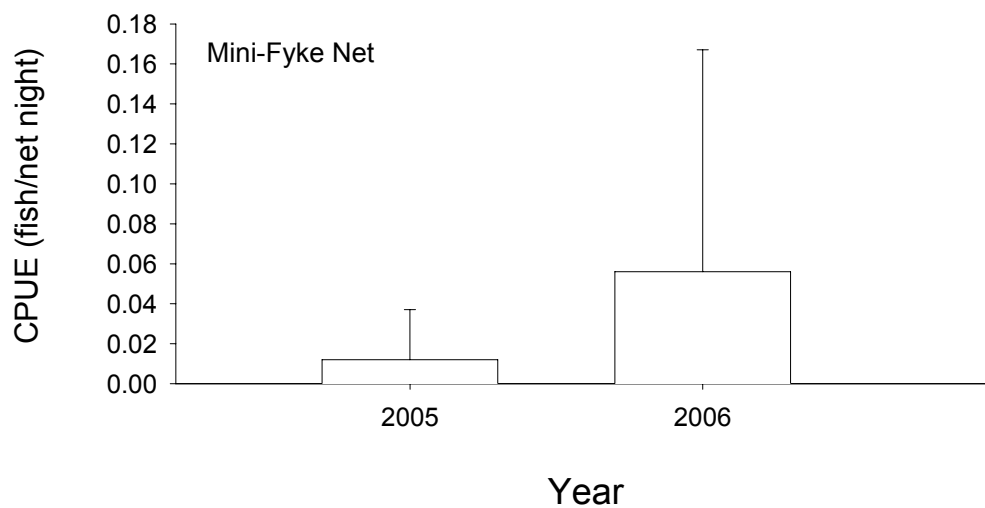


Figure 24. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sicklefin chub using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005-2006.

Table 28. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	76	N-E	20 (26)	0 (0)	N-E	N-E	34 (33)	33 (27)	12 (9)	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	81	N-E	20 (25)	0 (0)	N-E	N-E	30 (35)	36 (34)	10 (3)	5 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	5	N-E	0 (8)	0 (0)	N-E	N-E	100 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	146	N-E	31 (28)	0 (0)	N-E	N-E	31 (34)	30 (32)	4 (3)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 29. Total number of sicklefin chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	76	0 (0)	95 (91)	5 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	81	0 (0)	100 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	5	100 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	146	0 (0)	96 (96)	4 (4)	N-E	N-E

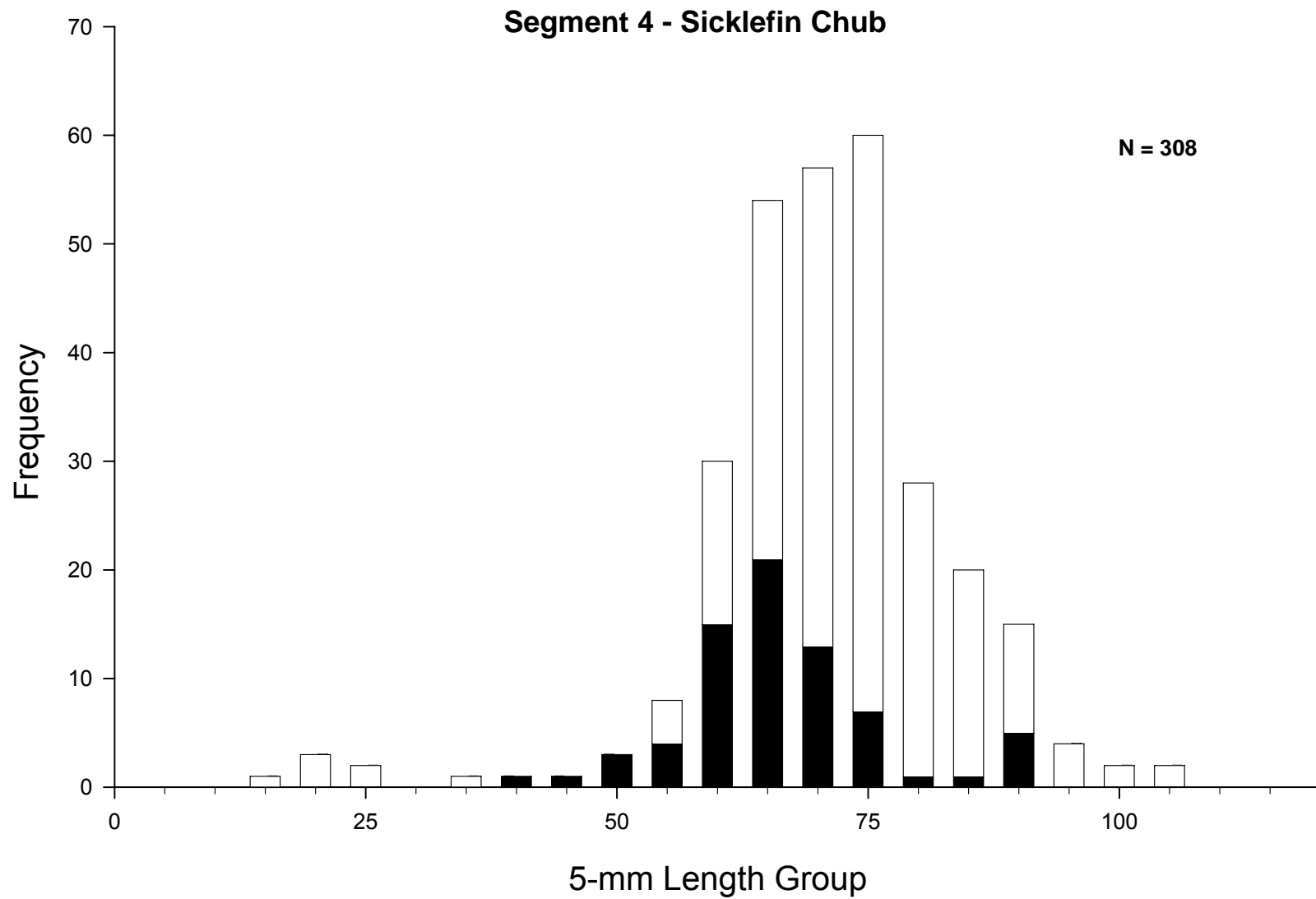


Figure 25. Length frequency of sicklefin chubs during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

**Speckled Chub**

No speckled chubs were captured during the 2006 sampling season in segment 4.

## Segment 4 - Speckled Chub / Sturgeon Season

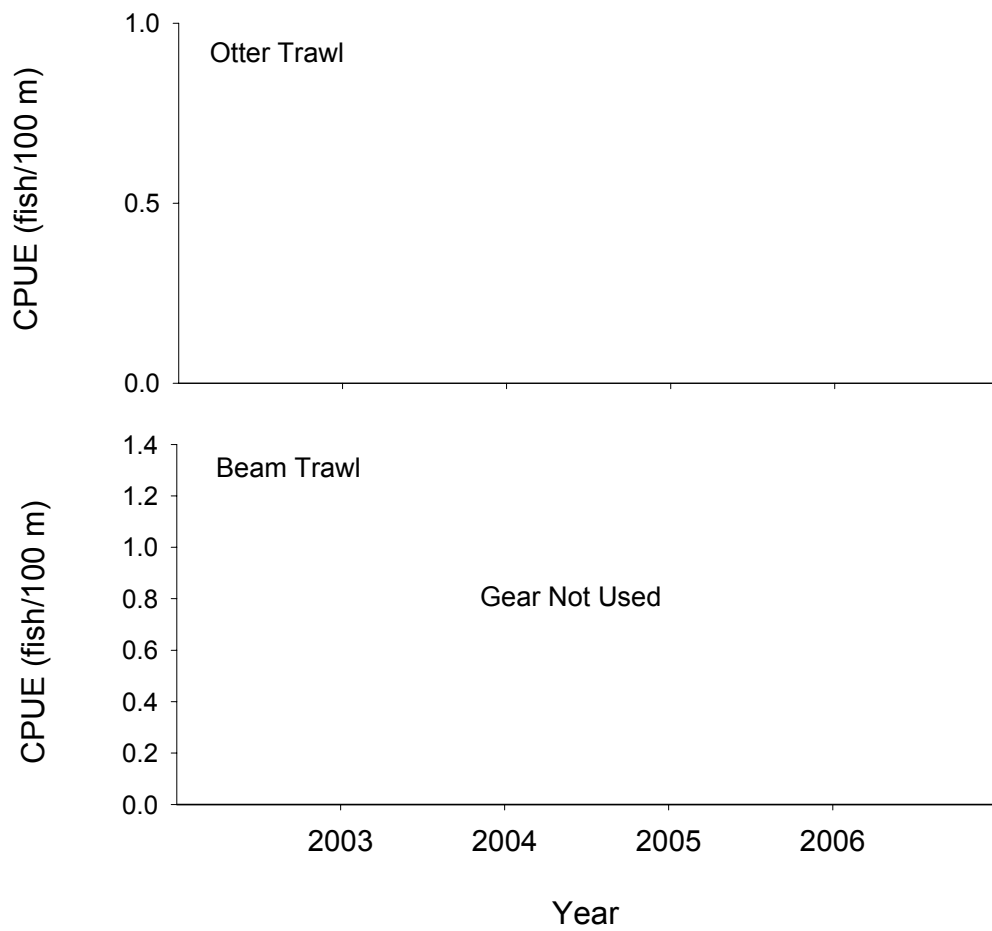


Figure 26. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub using otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 -2006.

## Segment 4 - Speckled Chub / Fish Community Season

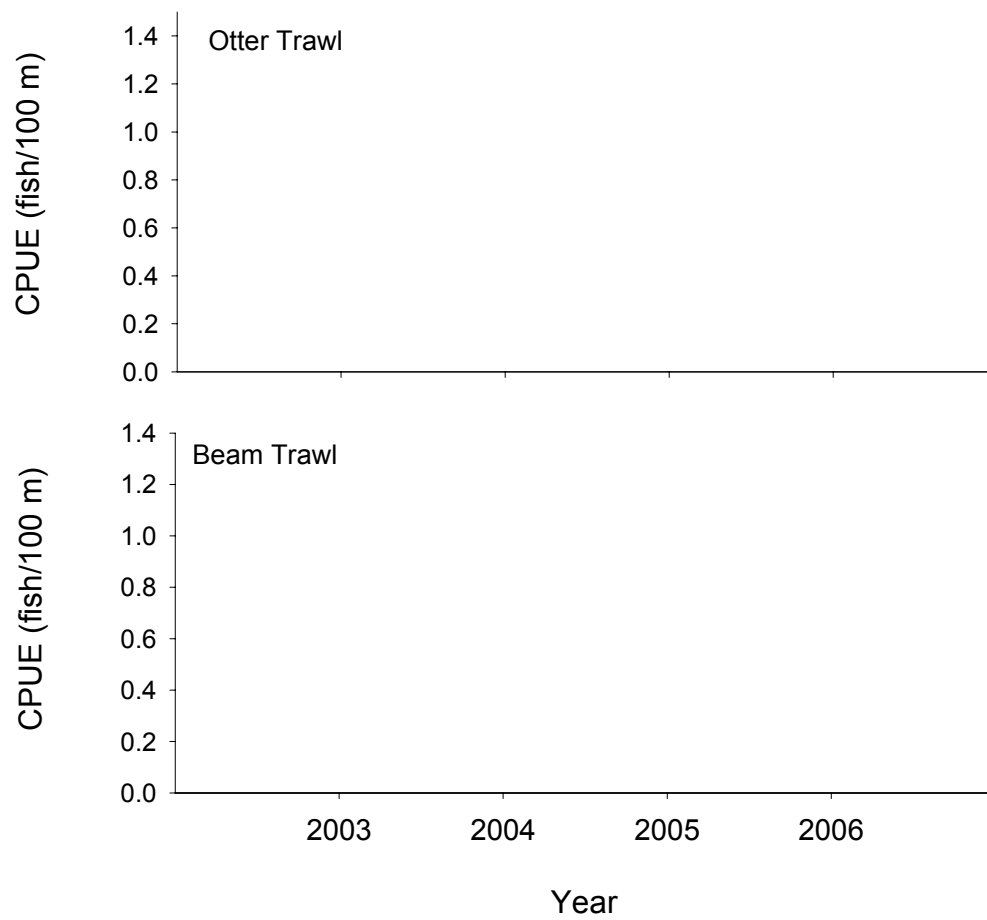


Figure 27. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub in segment 4 of the Missouri River during fish community season 2005 -2006.

## Segment 4 - Speckled Chub / Fish Community Season

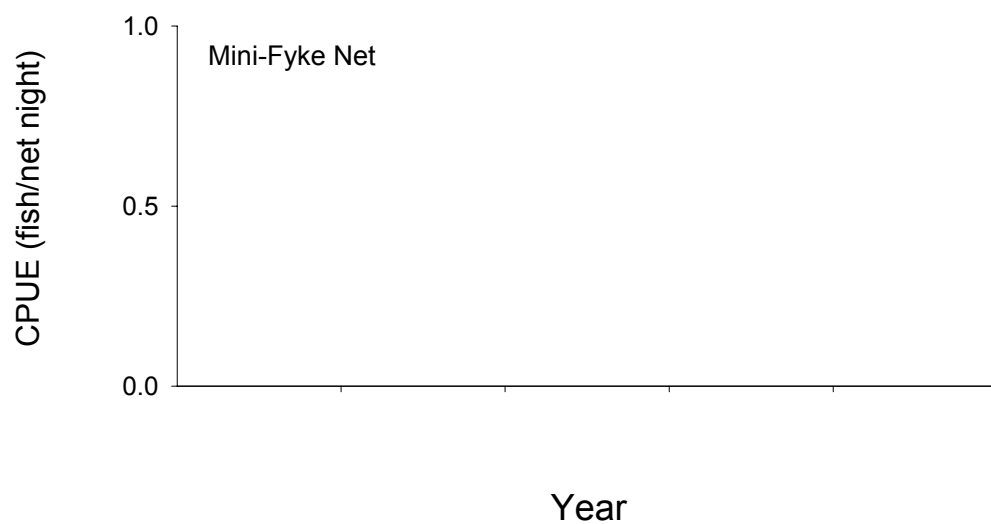


Figure 28. Mean annual catch-per-unit-effort ( $\pm$  2SE) of speckled chub using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 -2006.

Table 30. Total number of speckled chubs captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	0	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	0	N-E	0 (28)	0 (0)	N-E	N-E	0 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 31. Total number of speckled chubs captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	0	0 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E

**Sand Shiner**

A total of five sand shiners were captured in 2006. Four were sampled in mini-fyke nets and one captured in the otter trawl.

#### Segment 4 - Sand Shiner / Sturgeon Season

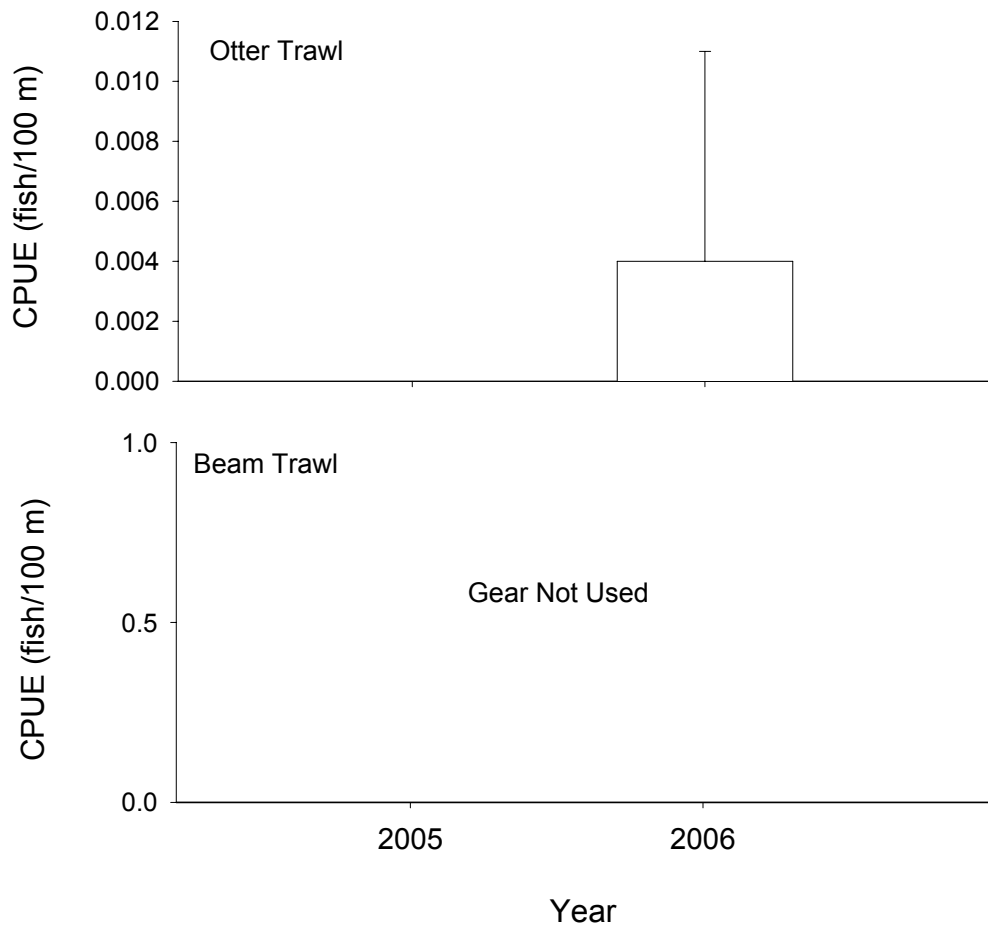


Figure 30. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sand shiner with otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 -2006.

## Segment 4 - Sand Shiner / Fish Community Season

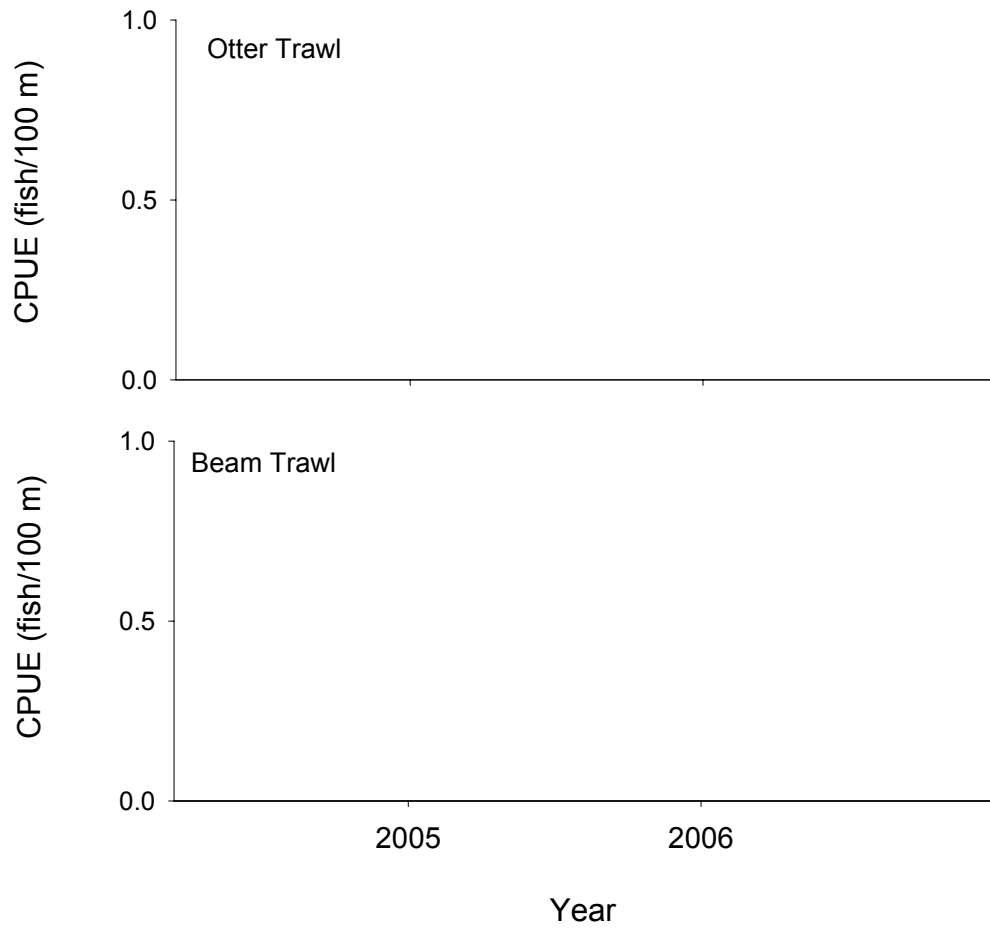


Figure 31. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sand shiner with otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 -2006.

#### Segment 4 - Sand Shiner / Fish Community Season

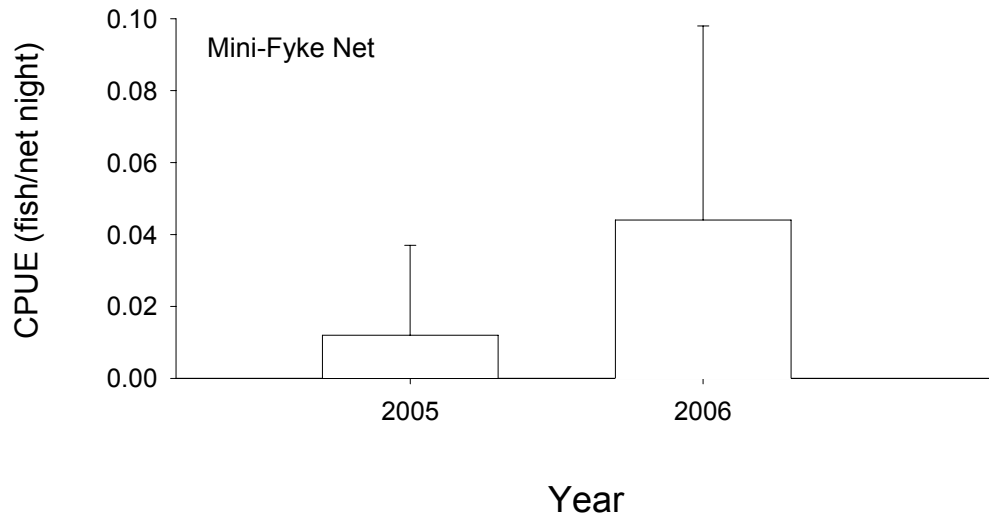


Figure 32. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sand shiner with mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006.

Table 32. Total number of sand shiners captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	1	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	100 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	4	N-E	25 (8)	0 (0)	N-E	N-E	75 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	0	N-E	0 (28)	0 (0)	N-E	N-E	0 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 33. Total number of sand shiners captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	1	0 (0)	100 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	4	100 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E

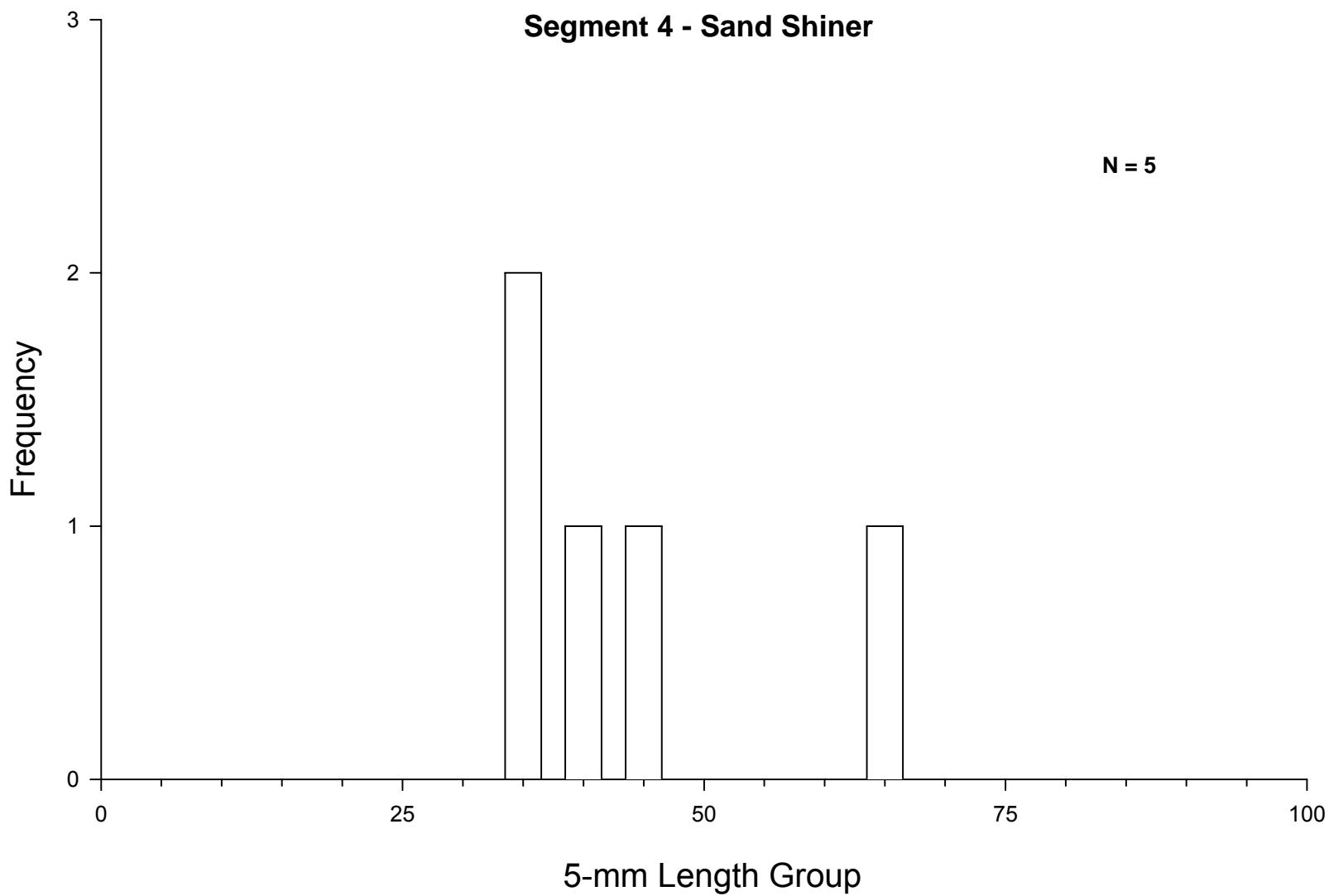


Figure 33. Length frequency of sand shiners during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

### ***Hybognathus* spp.**

A total of 289 *hybognathus* spp. were collected during the 2006 fish community season. No *hybognathus* spp. were sampled during the sturgeon season. Catch per unit effort (Figure 36) was greatest for mini-fyke nets (3.189 fish/net night) followed by otter trawls (0.007 fish/100 m). Over 99% (287) of *hybognathus* spp. were sampled in mini-fyke nets, while 1% (2) were captured in otter trawls. In 2005, 5826 *Hybognathus* spp. were collected in mini-fyke nets (68.98 fish/net night), bag seines (3.97 fish/m<sup>2</sup>), and otter trawl (0.032 fish/100 m). A large portion of fish (47%) were captured in two mini-fyke nets in 2005. The majority of 2006 *hybognathus* spp. were sampled in inside bend macrohabitats (69%). The bar mesohabitat was where most *hybognathus* spp. were sampled (Table 35). Over 43% of *hybognathus* spp. were between 25 - 49 mm total length (Figure 37), 31% were between 50 and 74 mm, 23% were between 75 and 99 mm, and 2% were between 100 – 125 mm in total length (Figure 37).

#### Segment 4 - *Hybognathus* spp. / Sturgeon Season

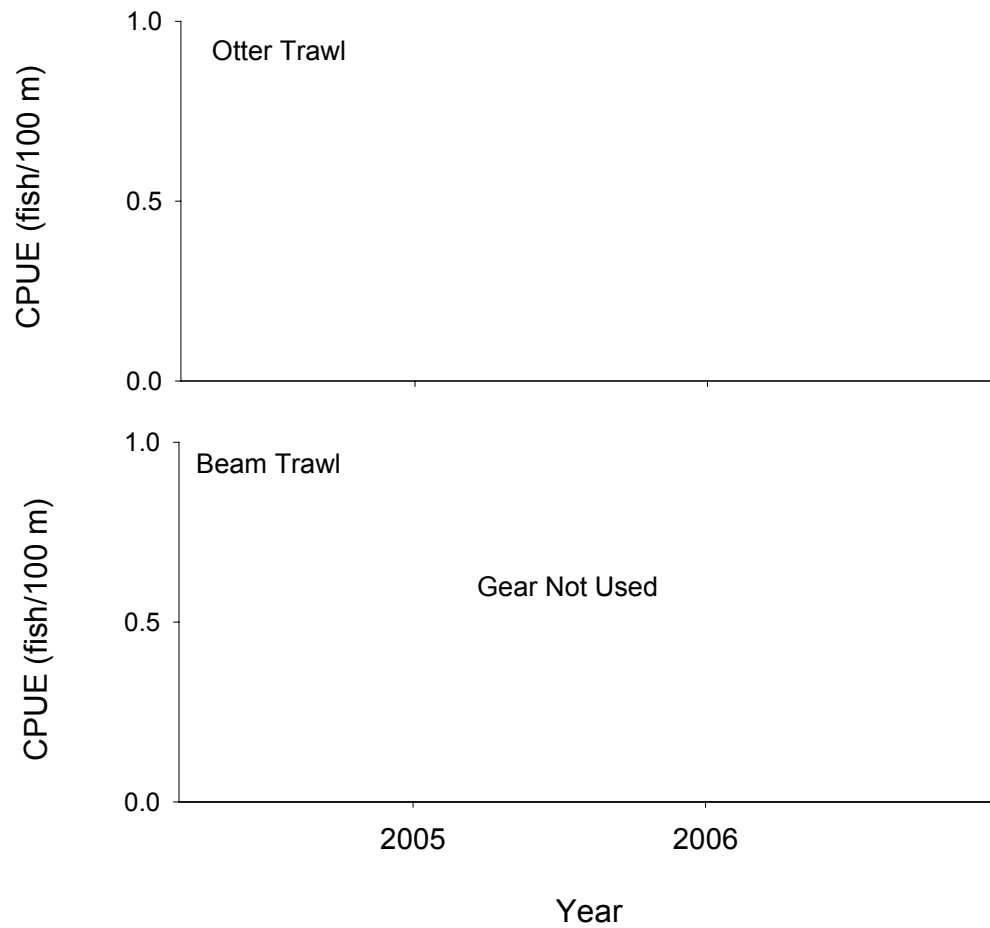


Figure 34. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of *Hybognathus* spp. with otter trawls and beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

#### Segment 4 - *Hybognathus* spp. / Fish Community Season

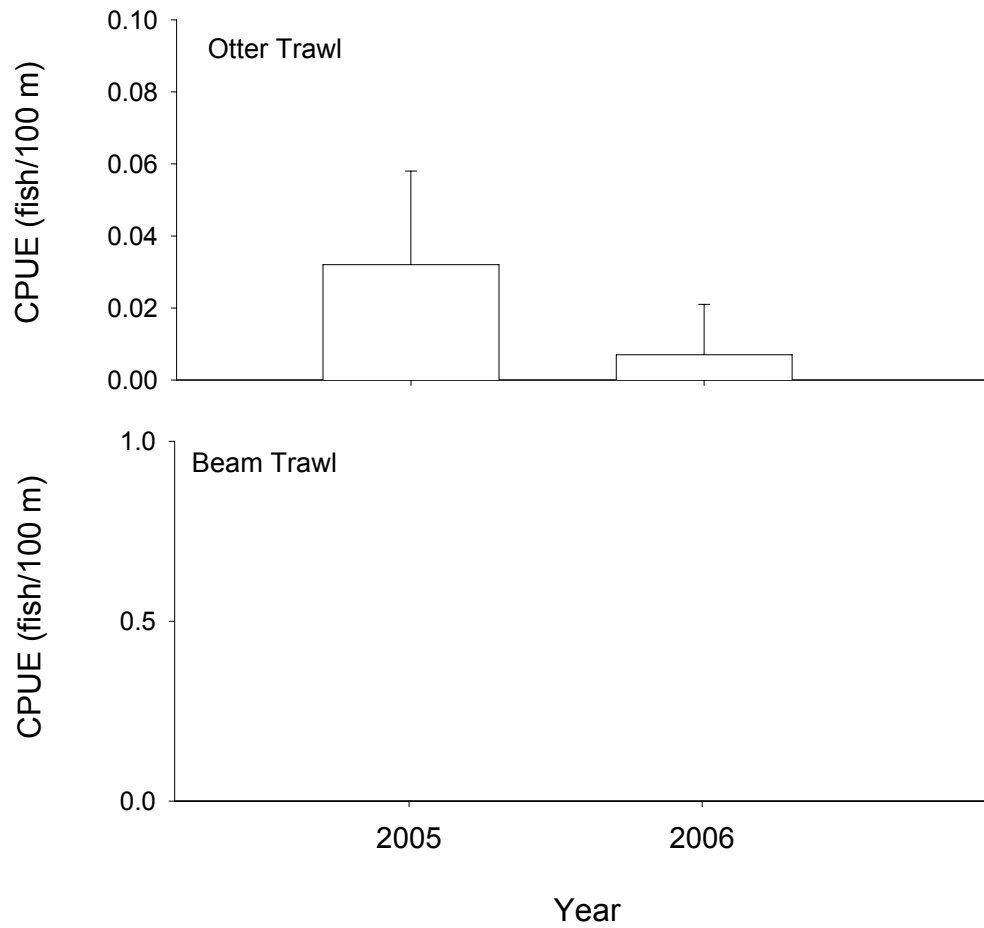


Figure 35. Mean annual catch-per-unit-effort ( $\pm 2$ SE) of *Hybognathus* spp. with otter trawls and beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.

## Segment 4 - *Hybognathus* spp. / Fish Community Season

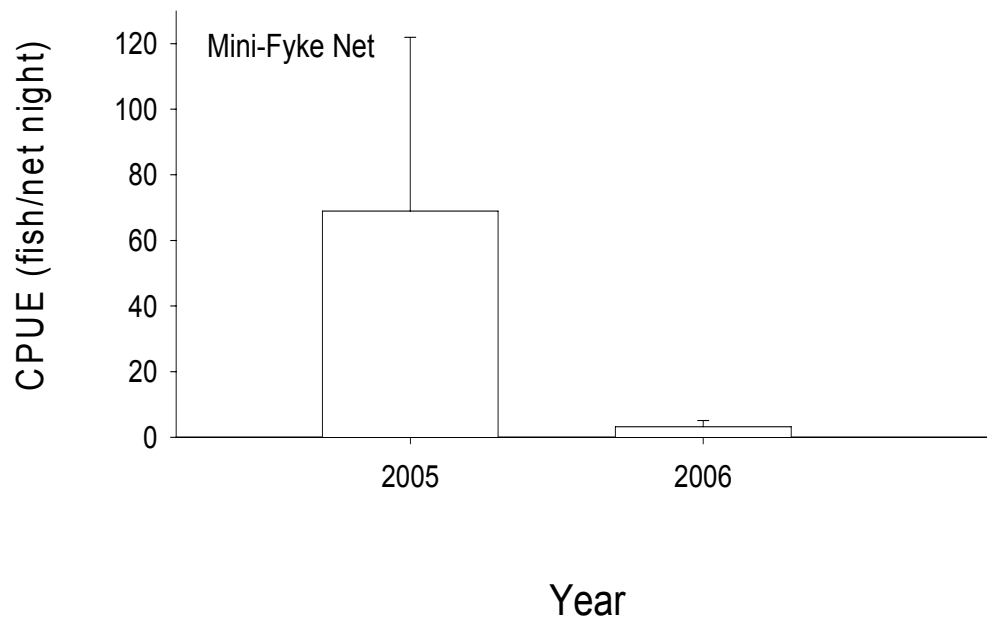


Figure 36. Mean annual catch-per-unit-effort ( $\pm$  2SE) of *Hybognathus* spp. with mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006.

Table 34. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	0	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	0 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	0	N-E	0 (24)	0 (0)	N-E	N-E	0 (32)	0 (30)	0 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	287	N-E	7 (8)	0 (0)	N-E	N-E	69 (39)	0 (7)	7 (26)	9 (14)	3 (6)	0 (0)	0 (0)	5 (0)	0 (0)
Otter Trawl	2	N-E	0 (28)	0 (0)	N-E	N-E	100 (34)	0 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 35. Total number of *Hybognathus* spp. captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	0	0 (0)	0 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	0	0 (1)	0 (86)	0 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	287	90 (79)	0 (1)	10 (20)	N-E	N-E
Otter Trawl	2	0 (0)	100 (96)	0 (4)	N-E	N-E

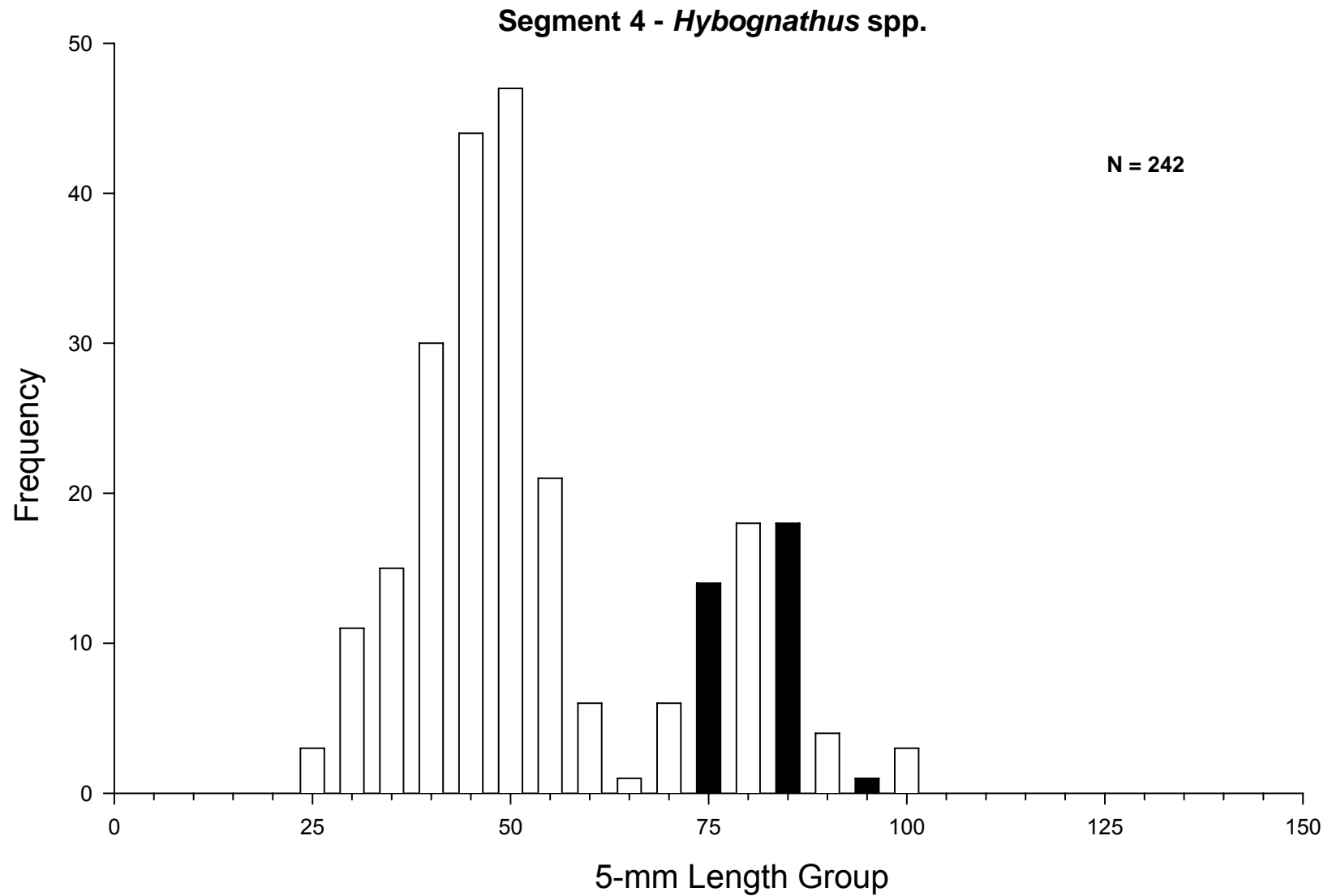


Figure 37. Length frequency of *Hybognathus* spp. caught during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

## **Blue Sucker**

Twelve blue suckers were captured during the 2006 fish community season and one during the sturgeon season. Ten blue suckers were captured in trammel nets (CPUE 0.05 fish/100 m) during fish community season. One was sampled in the otter trawl (CPUE 0.003 fish/100 m) during sturgeon season (Figure 38) and two were collected in the otter trawl (CPUE 0.005 fish/100 m) during the fish community season (Figure 41). One blue sucker sampled in the otter trawl during fish community season was sampled in the Yellowstone River 2.1 river miles from the confluence. Only four blue suckers were captured during the 2005 sampling season. All four were sampled during the fish community season with three captured in the trammel net and one in the otter trawl. In 2006, seven of the ten blue suckers sampled in trammel nets were found in channel crossover macrohabitats. The remaining three were captured in different macrohabitats: inside bend, outside bend, and large connected secondary channel. The blue suckers captured in the otter trawl were sampled in outside bend macrohabitats (Table 36).

## Segment 4 - Blue Sucker / Sturgeon Season

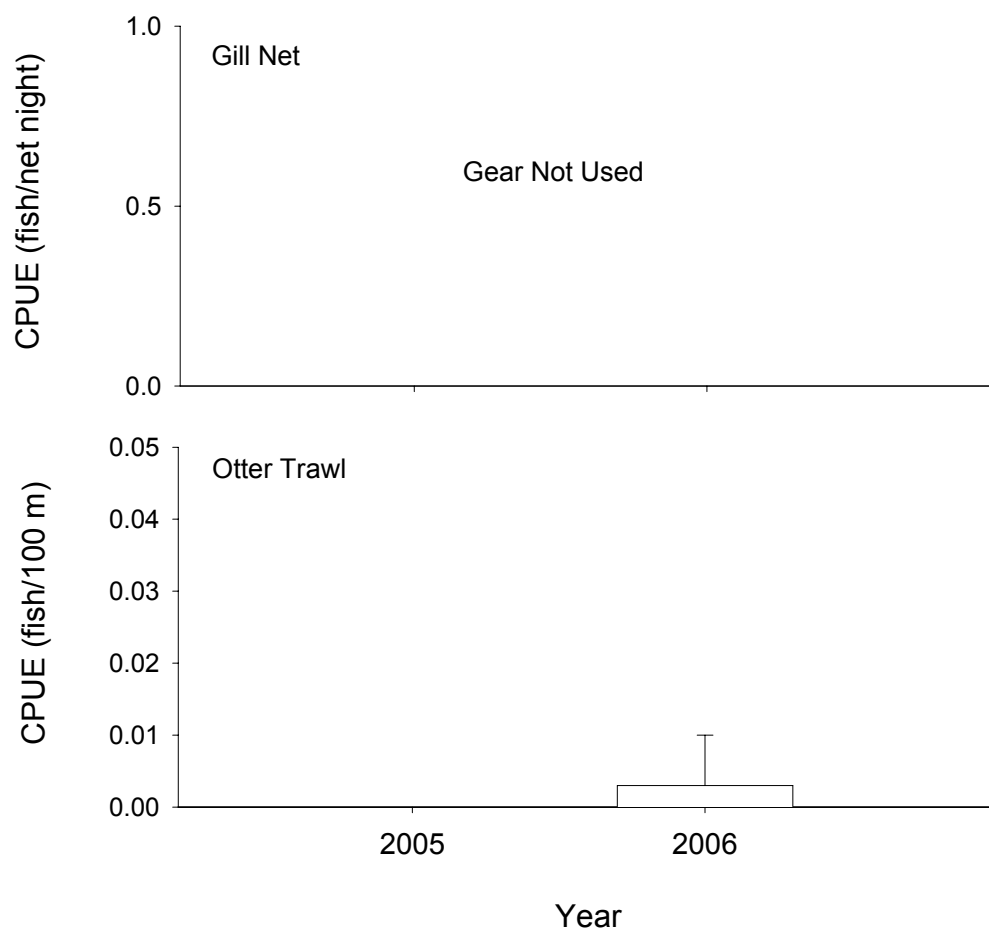


Figure 38. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of blue sucker with gill nets and otter trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Blue Sucker / Sturgeon Season

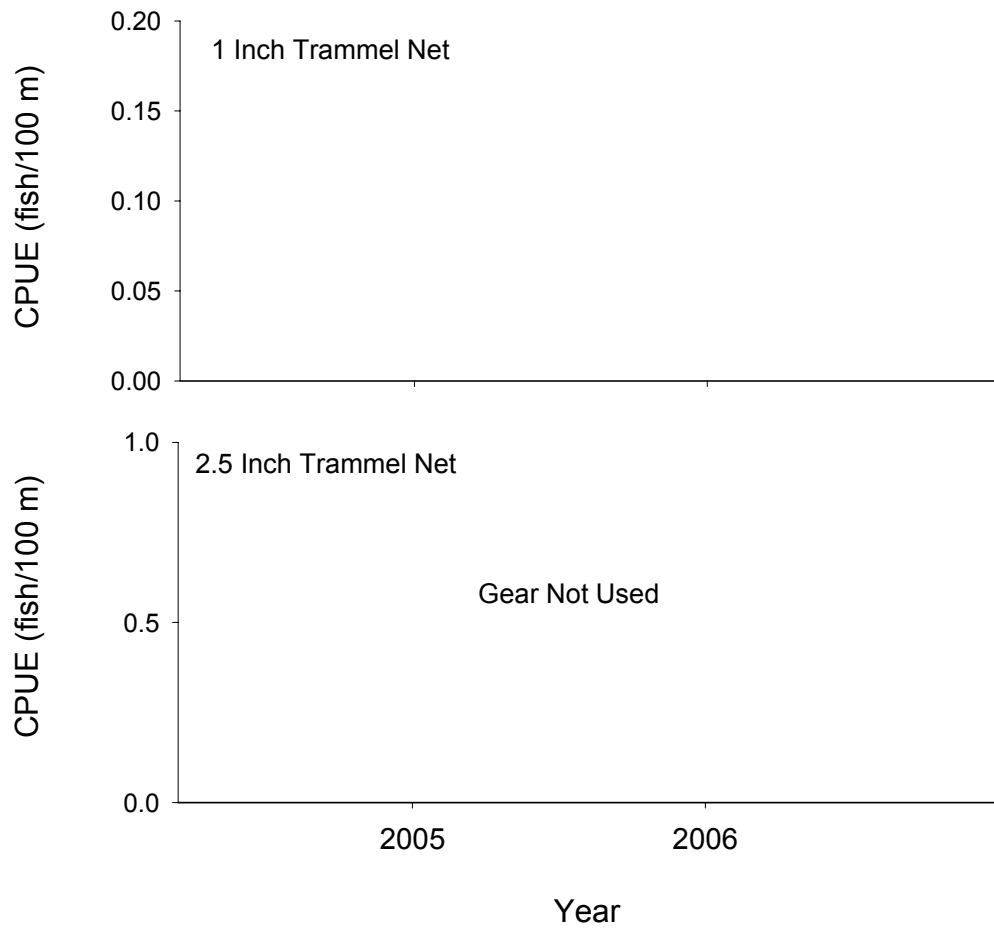


Figure 39. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of blue sucker with 1 and 2.5 inch trammel nets in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

### Segment 4 - Blue Sucker / Sturgeon Season

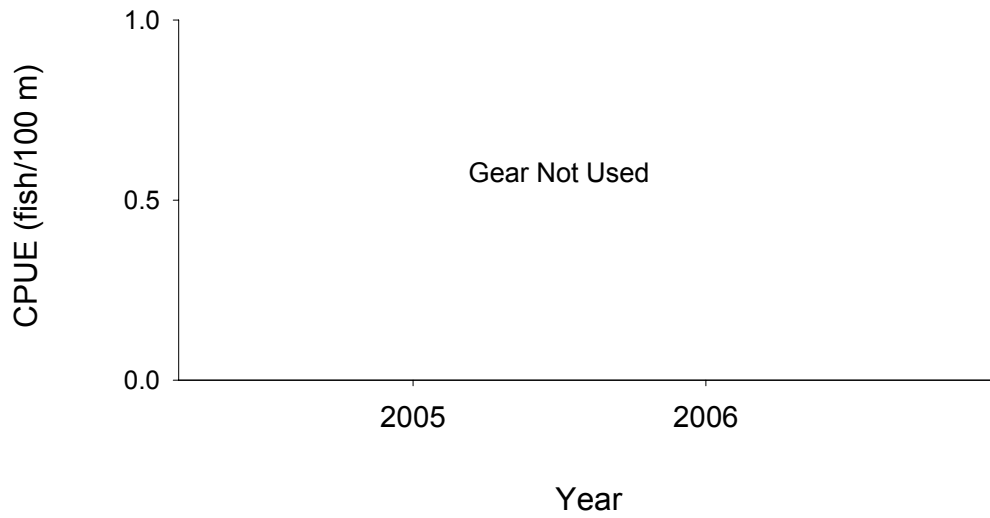


Figure 40. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker with beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Blue Sucker / Fish Community Season

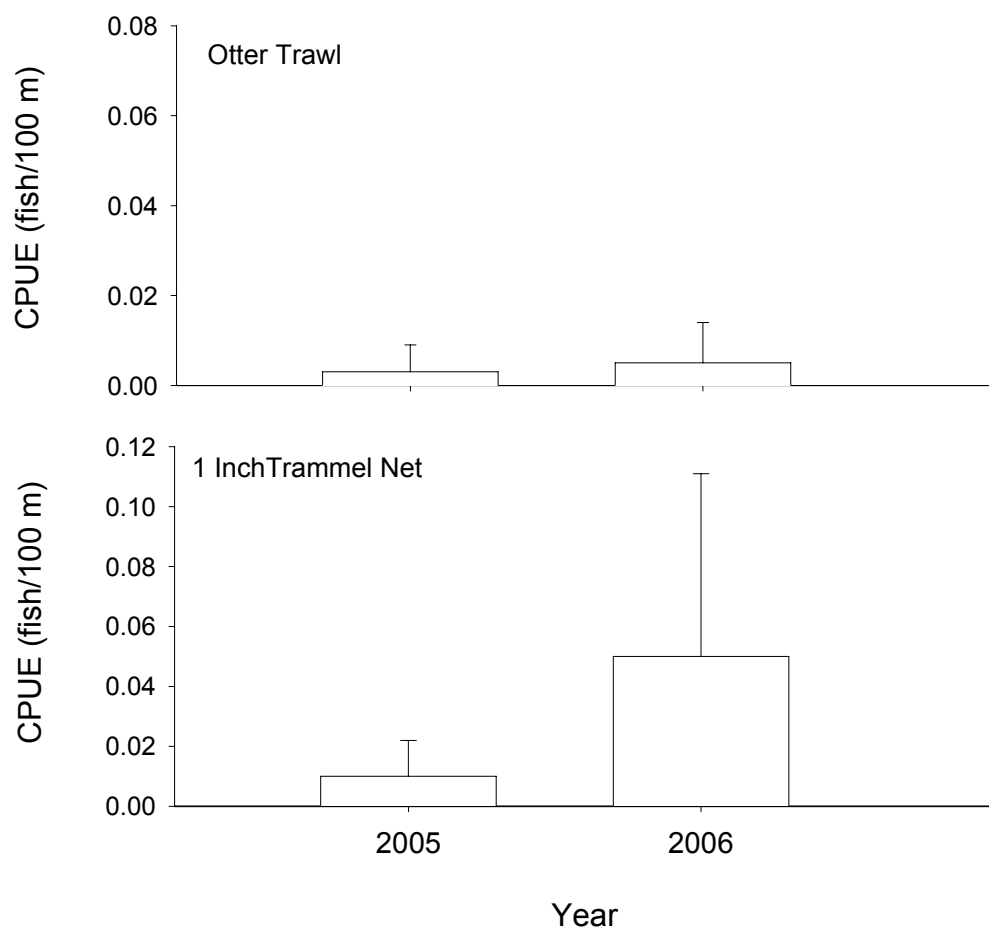


Figure 41. Mean annual catch-per-unit-effort ( $\pm 2$ SE) of blue sucker using otter trawls and 1 inch trammel nets in segment 4 of the Missouri River during fish community season 2005 - 2006.

## Segment 4 - Blue Sucker / Fish Community Season

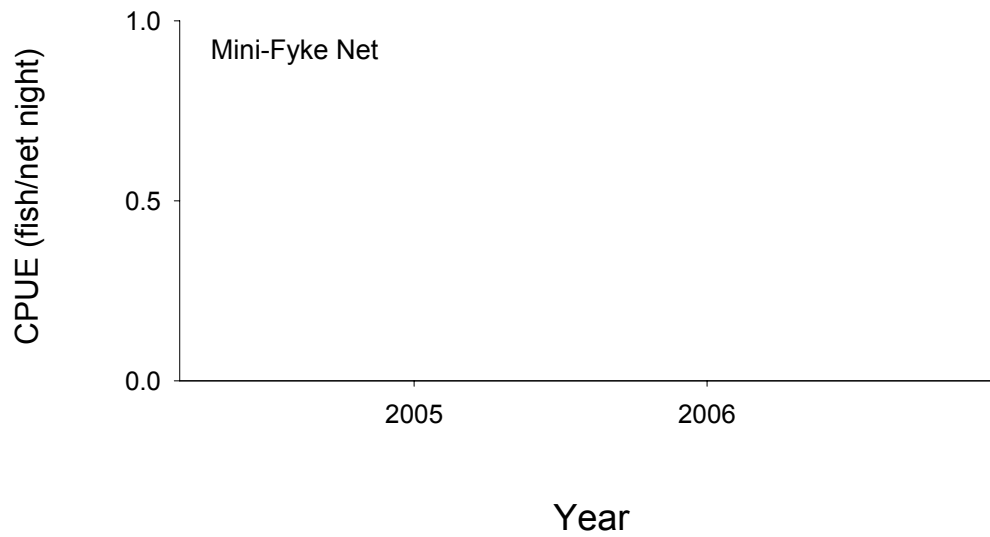


Figure 42. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue suckers using mini-fyke nets in segment 4 of the Missouri River during fish community season 2005 - 2006.

## Segment 4 - Blue Sucker / Fish Community Season

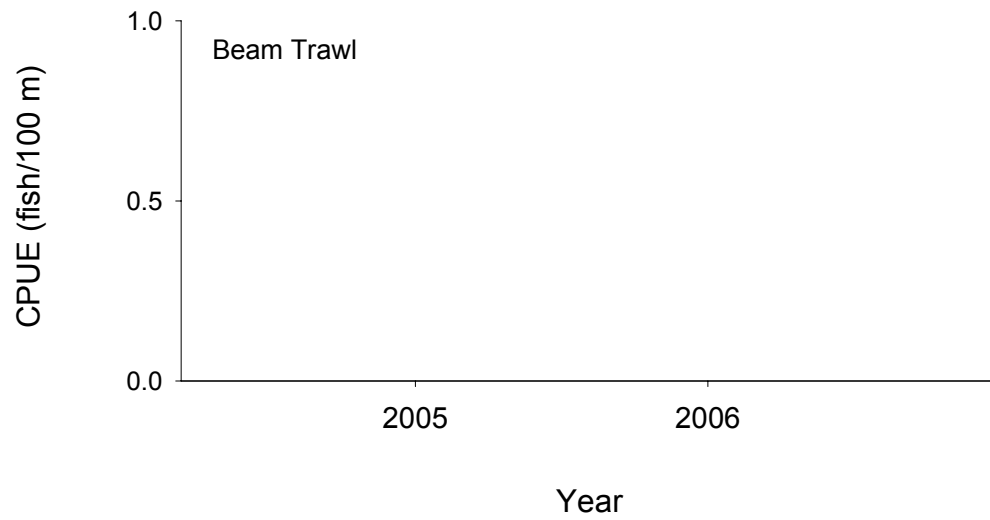


Figure 43. Mean annual catch-per-unit-effort ( $\pm$  2SE) of blue sucker using beam trawls in segment 4 of the Missouri River during fish community season 2005 - 2006.

Table 36. Total number of blue suckers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	0	N-E	0 (27)	0 (0)	N-E	N-E	0 (38)	0 (30)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	1	N-E	0 (26)	0 (0)	N-E	N-E	0 (33)	100 (27)	0 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	10	N-E	70 (24)	0 (0)	N-E	N-E	10 (32)	10 (30)	10 (4)	0 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	0	N-E	0 (25)	0 (0)	N-E	N-E	0 (35)	0 (34)	0 (3)	0 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	0	N-E	0 (8)	0 (0)	N-E	N-E	0 (39)	0 (7)	0 (26)	0 (14)	0 (6)	0 (0)	0 (0)	0 (0)	0 (0)
Otter Trawl	1	N-E	0 (28)	0 (0)	N-E	N-E	0 (34)	100 (32)	0 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 37. Total number of blue suckers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	0	0 (0)	0 (97)	0 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	1	0 (0)	100 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	10	0 (1)	90 (86)	10 (13)	N-E	N-E
Beam Trawl	0	0 (0)	0 (96)	0 (4)	N-E	N-E
Mini-Fyke Net	0	0 (79)	0 (1)	0 (20)	N-E	N-E
Otter Trawl	1	0 (0)	100 (96)	0 (4)	N-E	N-E

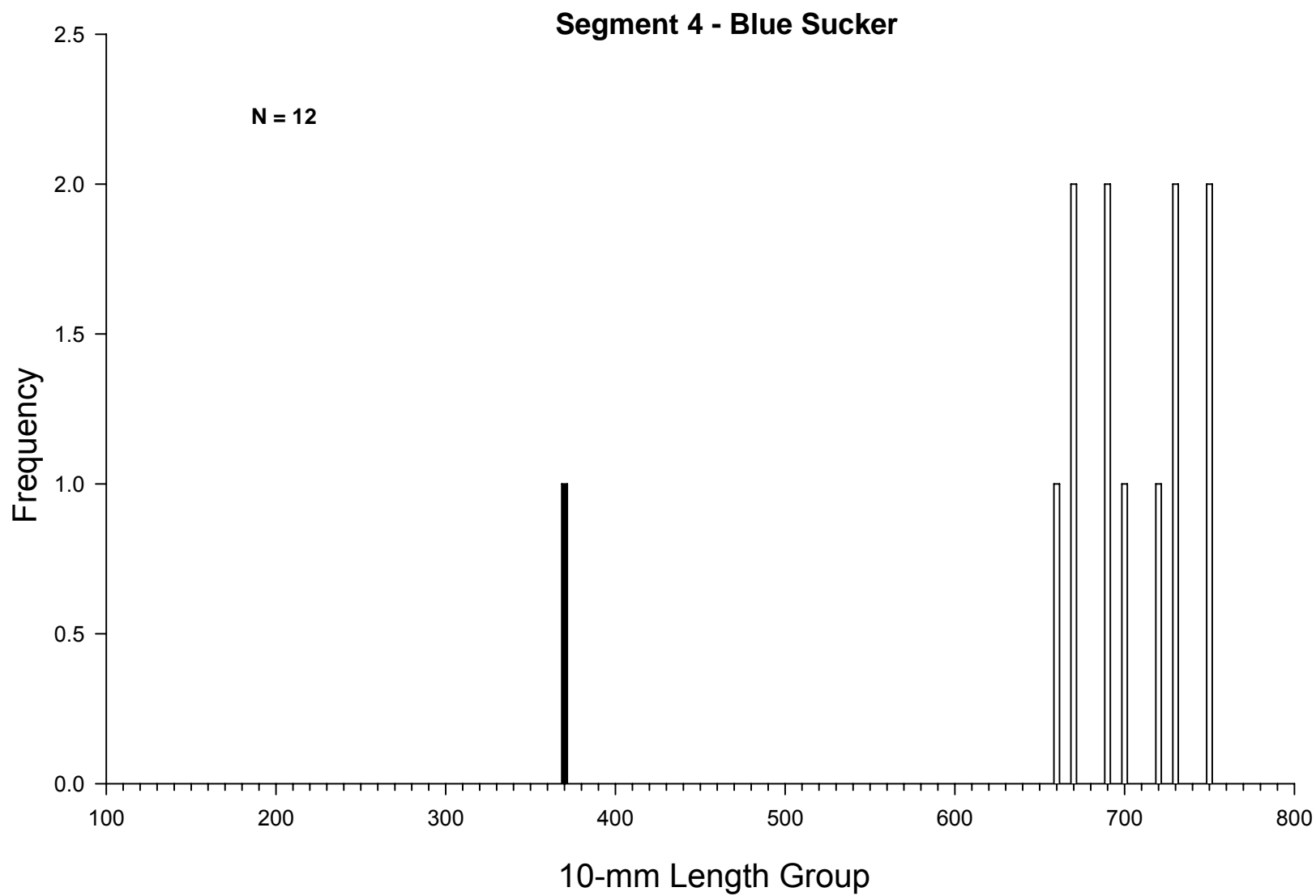


Figure 44. Length frequency of blue suckers during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

## Sauger

A total of 190 sauger were sampled during 2006 with 68 fish captured in mini-fyke nets, 72 in trammel nets, 19 in otter trawls, and six in beam trawls. Trammel net CPUE for sauger during the sturgeon season was 0.16 fish/100 m and 0.158 fish/100 m during fish community season. Otter trawl CPUE for sauger during the sturgeon season was 0.014 fish/100 m and 0.51 fish/100 m during the fish community season. Catch per unit effort of sauger in the beam trawl was 0.024 fish/100 m. For mini-fyke nets, CPUE was 0.756 fish/net night in 2006 and 1.284 fish/net night in 2005 (Figures 45-50). In 2005, CPUE of sauger in trammel nets during sturgeon season and fish community season was 0.057 fish/100 m and 0.217 fish/100 m, respectively. Over 35% (N=55) of sauger captured in 2006 were associated with inside bend macrohabitats, followed by 23% (N=36) sauger sampled in large secondary channels, 17% (N=26) in channel crossovers, and 15 % (N=23) in small secondary channels (Table 38). Over 40% (N=62) of the sauger sampled in 2006 were under 150 mm. Only two of these were sampled during the sturgeon season (Figure 51).

## Segment 4 - Sauger / Sturgeon Season

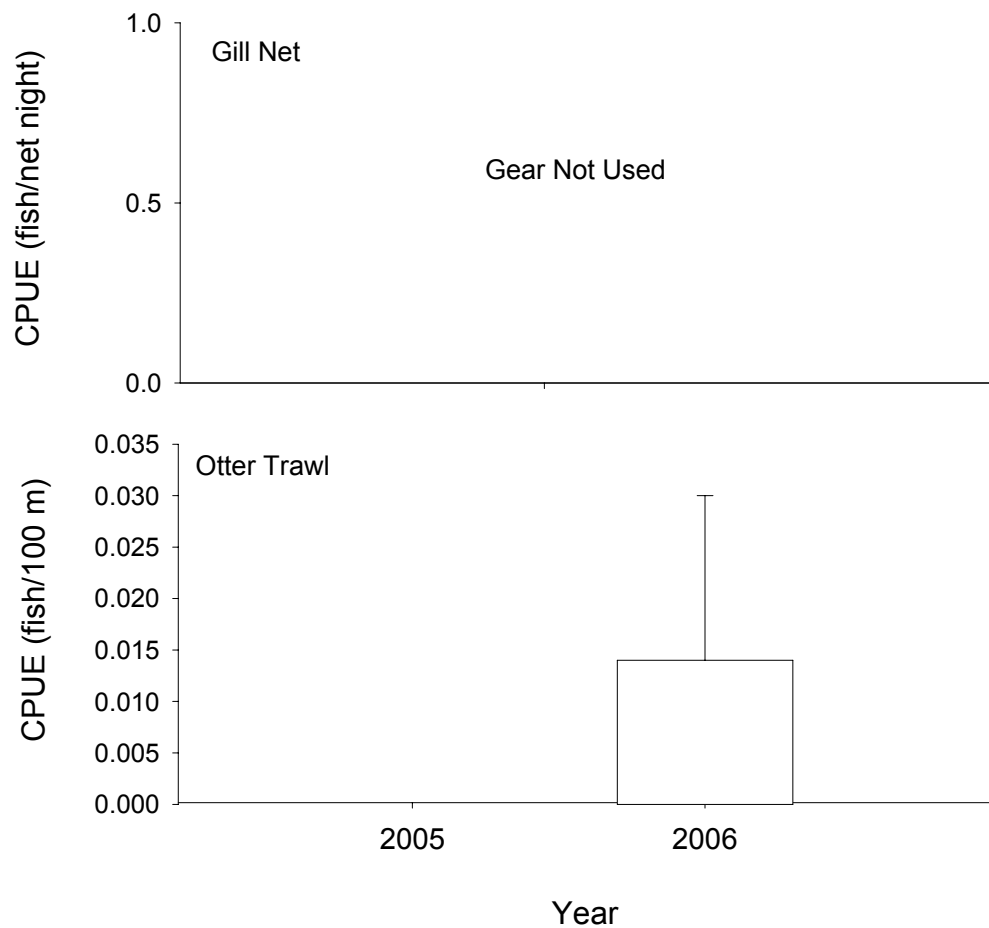


Figure 45. Mean annual catch-per-unit-effort ( $\pm$  2SE) of sauger in segment 4 of the Missouri River during sturgeon season 2005-2006.

## Segment 4 - Sauger / Sturgeon Season

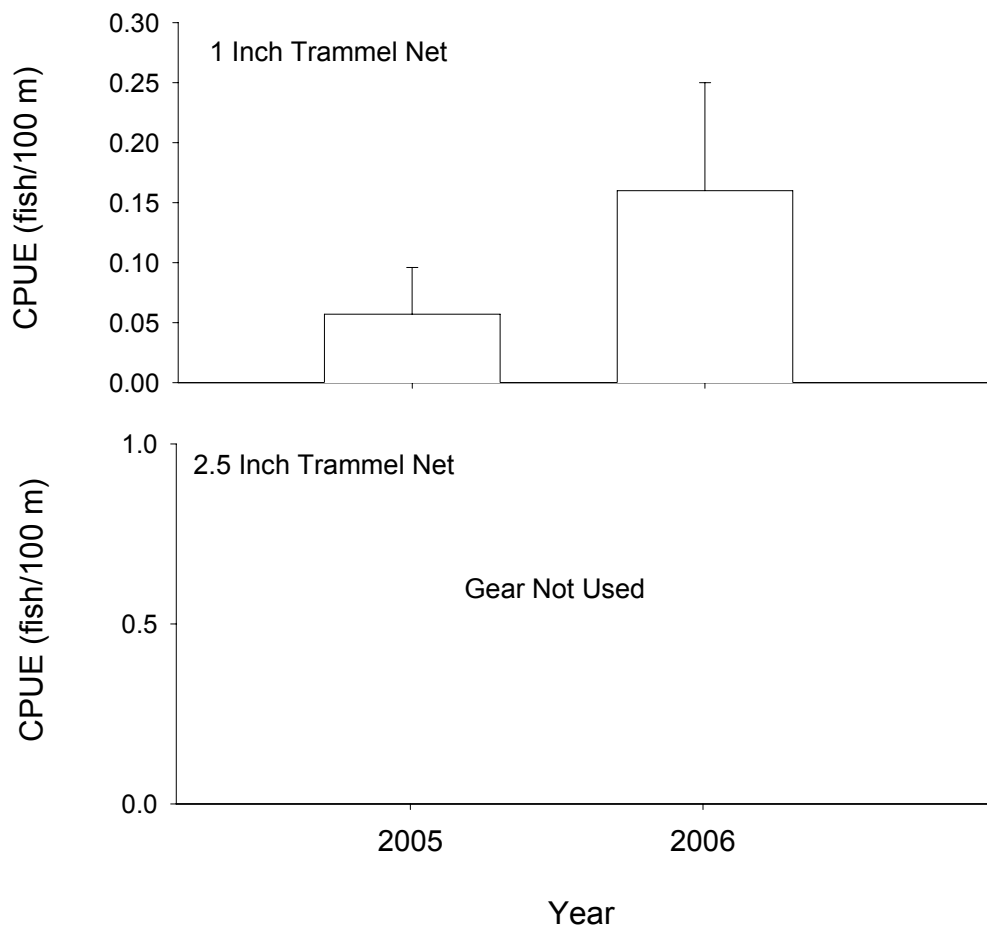


Figure 46. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger in segment 4 of the Missouri River during sturgeon season 2005-2006.

### Segment 4 - Sauger / Sturgeon Season

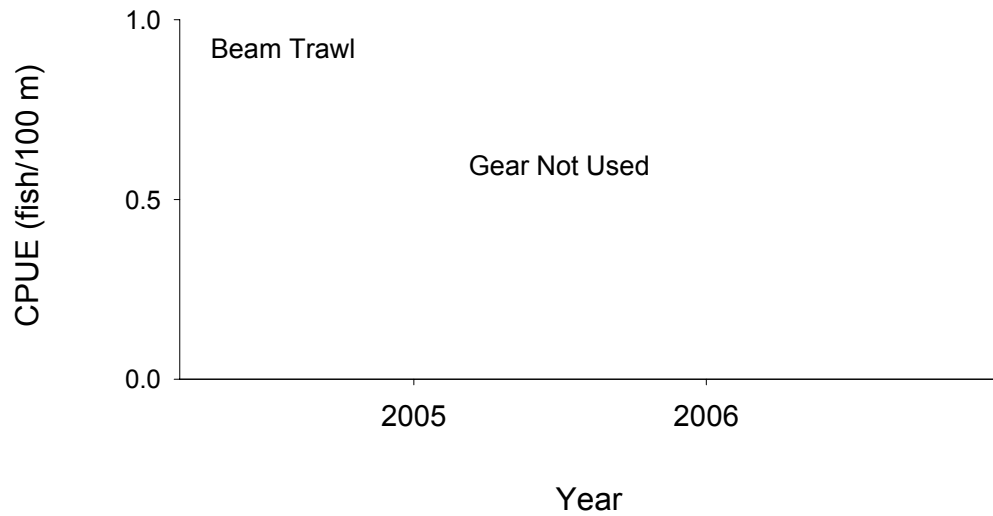


Figure 47. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger using beam trawls in segment 4 of the Missouri River during sturgeon season 2005 - 2006.

## Segment 4 - Sauger / Fish Community Season

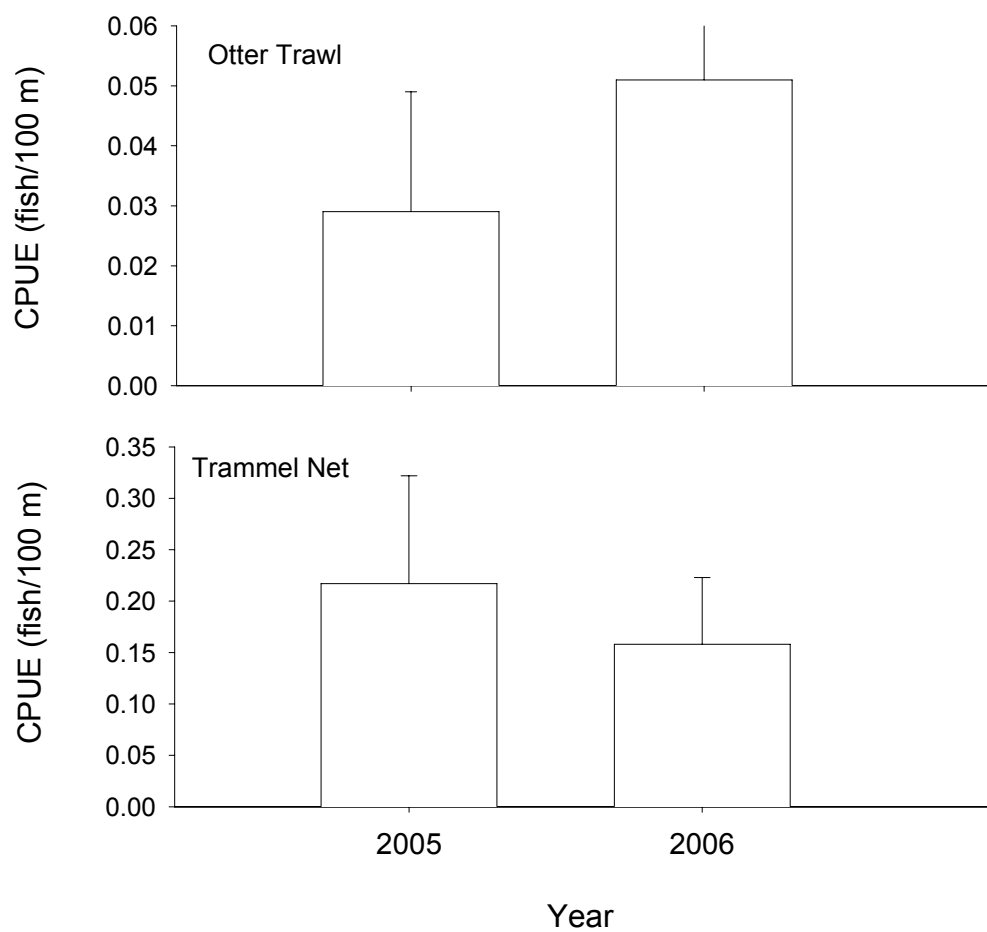


Figure 48. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger in segment 4 of the Missouri River during fish community season 2005-2006.

## Segment 4 - Sauger / Fish Community Season

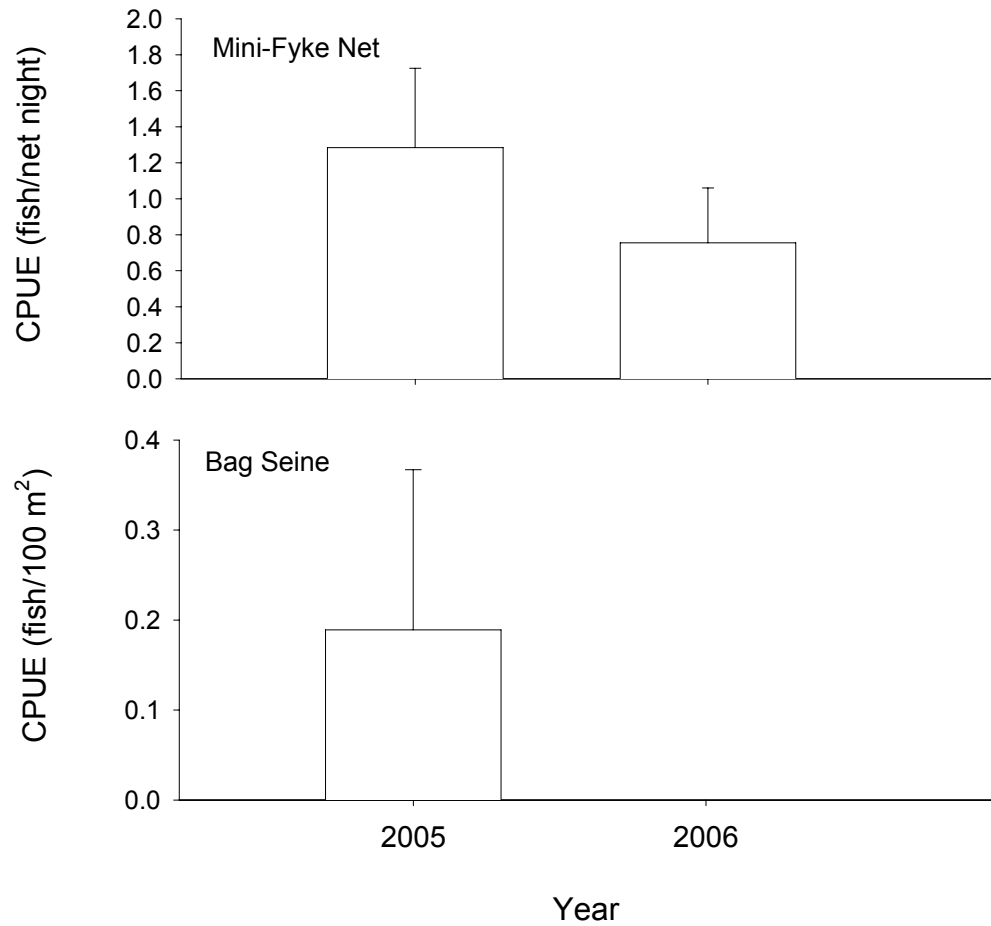


Figure 49. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger in segment 4 of the Missouri River during fish community season 2005-2006.

### Segment 4 - Sauger / Fish Community Season

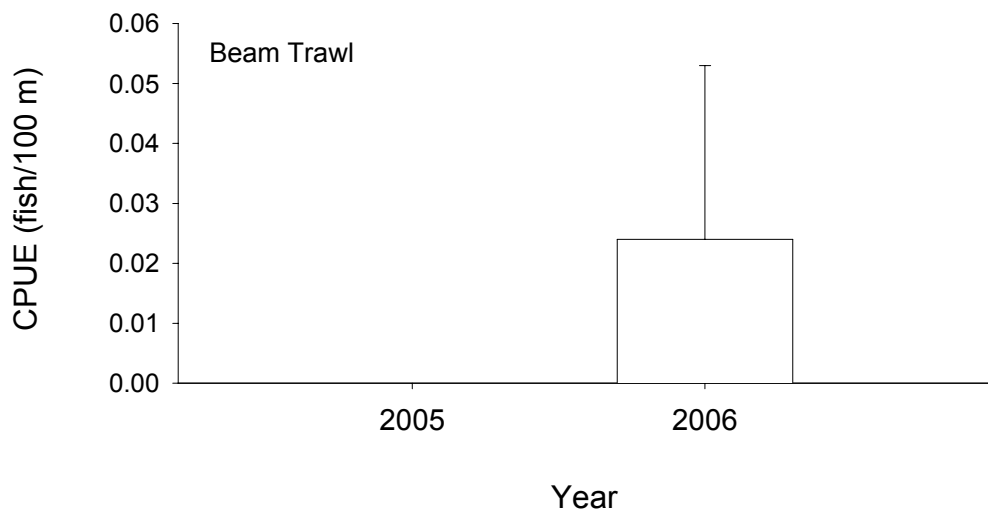


Figure 50. Mean annual catch-per-unit-effort ( $\pm 2SE$ ) of sauger in segment 4 of the Missouri River during fish community season 2005-2006.

Table 38. Total number of saugers captured for each gear during each season and the proportion caught within each macrohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Macrohabitat													
		BRAD	CHXO	CONF	DEND	DRNG	ISB	OSB	SCCL	SCCS	SCCN	TRIB	TRML	TRMS	WILD
Sturgeon Season (Fall through Spring)															
1 Inch Trammel Net	32	N-E	28 (27)	0 (0)	N-E	N-E	44 (38)	16 (30)	12 (6)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2.5 Inch Trammel Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beam Trawl	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Gill Net	-	N-E	- -	- -	N-E	N-E	- -	- -	- -	- -	- -	- -	- -	- -	- -
Otter Trawl	4	N-E	25 (26)	0 (0)	N-E	N-E	25 (33)	0 (27)	50 (9)	0 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fish Community Season (Summer)															
1 Inch Trammel Net	34	N-E	29 (24)	0 (0)	N-E	N-E	35 (32)	18 (30)	3 (4)	15 (9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Beam Trawl	6	N-E	17 (25)	0 (0)	N-E	N-E	50 (35)	17 (34)	0 (3)	17 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mini-Fyke Net	68	N-E	1 (8)	0 (0)	N-E	N-E	26 (39)	1 (7)	37 (26)	25 (14)	3 (6)	0 (0)	0 (0)	6 (0)	0 (0)
Otter Trawl	14	N-E	21 (28)	0 (0)	N-E	N-E	50 (34)	7 (32)	21 (3)	0 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 39. Total number of saugers captured for each gear during each season and the proportion caught within each mesohabitat type in segment 4 of the Missouri River during 2005 – 2006. The percent of total effort for each gear in each habitat is presented on the second line of each gear type. N-E indicates the habitat is non-existent in the segment.

Gear	N	Mesohabitat				
		BARS	CHNB	ITIP	POOL	TLWG
Sturgeon Season (Fall through Spring)						
1 Inch Trammel Net	32	0 (0)	91 (97)	9 (3)	N-E	N-E
2.5 Inch Trammel Net	-	- -	- -	- -	N-E	N-E
Beam Trawl	-	- -	- -	- -	N-E	N-E
Gill Net	-	- -	- -	- -	N-E	N-E
Otter Trawl	4	0 (0)	100 (91)	0 (9)	N-E	N-E
Fish Community Season (Summer)						
1 Inch Trammel Net	34	9 (1)	74 (86)	18 (13)	N-E	N-E
Beam Trawl	6	0 (0)	83 (96)	17 (4)	N-E	N-E
Mini-Fyke Net	68	65 (79)	0 (1)	35 (20)	N-E	N-E
Otter Trawl	14	0 (0)	86 (96)	14 (4)	N-E	N-E

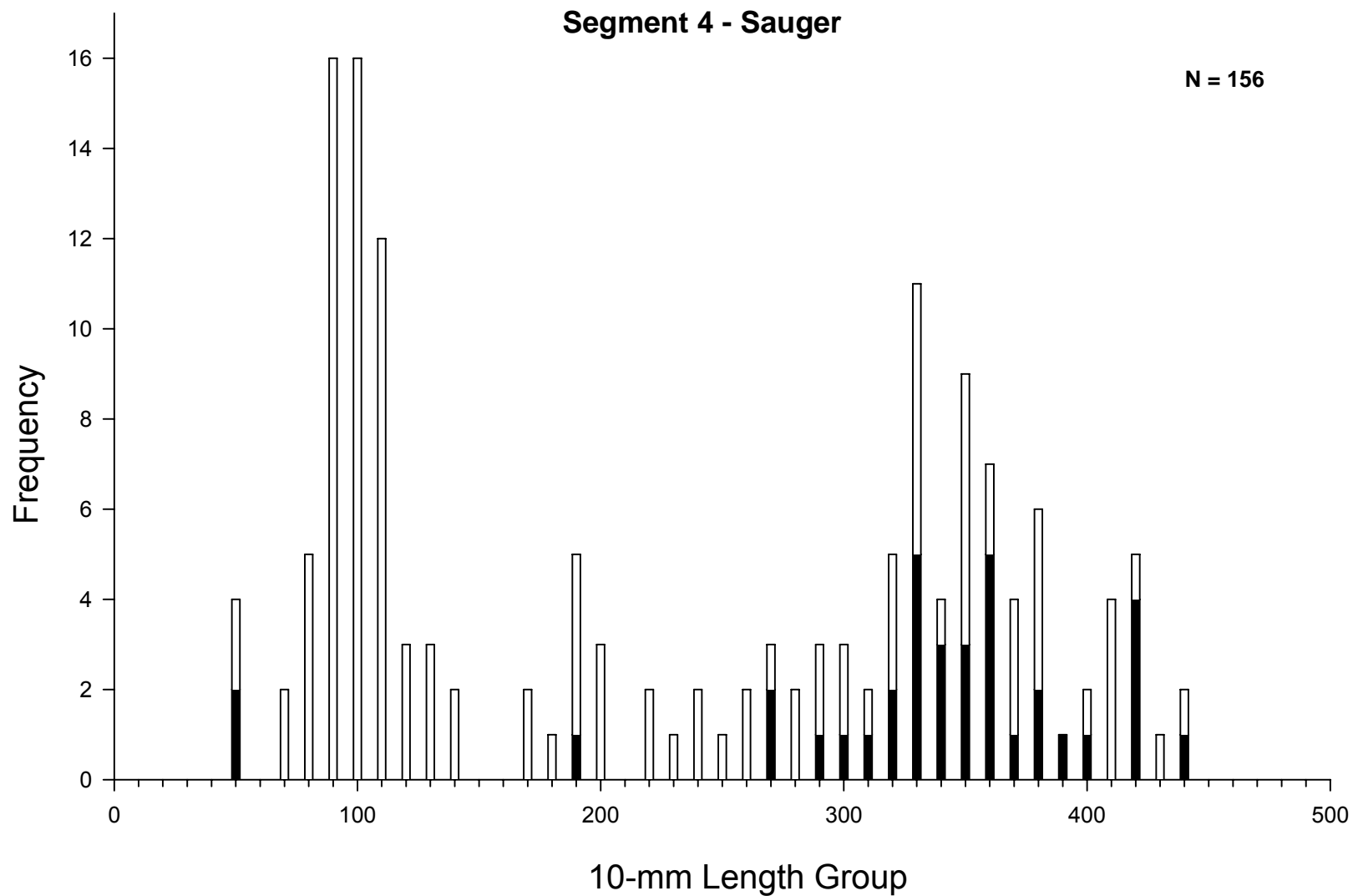


Figure 51. Length frequency of sauger during fall through spring (sturgeon season, black bars) and summer (fish community season, white bars) in segment 4 of the Missouri River during 2005 - 2006.

## Missouri River Fish Community

During the 2006 sampling season, 48,922 fish were sampled with standard gears in segment 4 of the Missouri River. Standard gears captured 29 different species of fish with emerald shiners contributing the largest percentage of total catch (91%, N = 43,623). Channel catfish were the next most abundant species (N = 1457), followed by flathead chubs (N = 693), white crappie (N = 558), and sturgeon chub (N = 541). More than 50 individuals were collected for 12 different species of fish. Twenty nine species were captured in multiply gears.

Trammel nets and otter trawls were the only gears deployed during the sturgeon season in 2006. A total of 1034 (427 in trammel nets, 592 in otter trawls) fish representing 18 species were captured in 48,086 meters of sampling (23,513 m TN, 24,573 m OT) (Appendices F2 and F4). Channel catfish (N = 254) were the most abundant species collected in trammel nets during the sturgeon season, followed by shovelnose sturgeon (N = 65) and sauger (N = 37). Additionally, trammel nets also collected goldeye (N = 30), bigmouth buffalo (N = 7), walleye (N = 7), pallid sturgeon (N = 6), smallmouth buffalo (N = 6), common carp (N = 5), river carpsuckers (N = 5), saugeye (N = 2), paddlefish (N = 1), stonecat (N = 1), and flathead chub (N = 1). The otter trawl sampled similar species of fish as trammel nets, including channel catfish (N = 312), shovelnose sturgeon (N = 33), stonecat (N = 19), pallid sturgeon (N = 1), flathead chub (N = 24), and common carp (N = 2). The otter trawl also sampled species of fish not collected with the trammel net including sturgeon chub (N = 115), sicklefin chub (N = 76), and emerald shiners (N = 10) during the 2006 sturgeon season (Appendix F).

During the fish community season, trammel nets captured 487 fish representing 15 species. There were 128 channel catfish collected in 23,376 meters of drifting. Shovelnose sturgeon (N = 233) comprised almost half of the catch, followed by goldeye (N = 35), sauger (N = 35), pallid sturgeon (N = 14), blue sucker (N = 10), and smallmouth buffalo (N = 9).

Otter trawls captured 911 fish representing 20 species during the fish community season in 30,412 m of sampling. Channel catfish (N = 401) were the most abundant species collected in otter trawls followed by sturgeon chubs (N = 157), sicklefin chubs (N = 146), and shovelnose sturgeon (N = 58). Seven species were sampled in the otter trawl that were not sampled in the

trammel net: sicklefin and sturgeon chubs, emerald shiners (N = 5), *Hybognathus* spp. (N = 3), white crappie (N = 5), sand shiner (N = 1), and white sucker (N = 1) (Appendix F4).

Mini-fyke nets collected more fish than any other gear used in segment 4. In 2006, there were 45,271 fish representing 20 species of fish. Emerald shiners (N = 43,623) were the most abundant species sampled, followed by flathead chubs (N = 510), white crappie (N = 377), *hybognathus* spp. (N = 287), and river carpsuckers (N = 277). Mini-fyke nets collected three species that were unique to that gear: fathead minnow (N = 29), white bass (N = 6), and burbot (N = 3) (Appendix F6).

In 2006, the beam trawl was implemented during the fish community season. In 24,074 m of sampling, the beam trawl caught 782 fish representing 15 species. Channel catfish (N = 325) were the most abundant species sampled in the beam trawl followed by sturgeon chub (N = 266), sicklefin chub (N = 81), and stonecat (N = 40). There were 26 shovelnose sturgeon and 18 flathead chubs captured in the beam trawl (Appendix F5).

## Discussion

Twenty seven pallid sturgeon were sampled in 2006. Three adults were collected while the remaining 22 are of hatchery origin. With the exception of 40 fish in 1998 at the confluence, all pallid sturgeon stocked in RPMA 2 have been stocked upriver of segment 4. Since sampling began in 2005, seven known 1997-1998 year class pallid sturgeon have been sampled. All of these have been sampled below rivermile 1570, with six of these being captured below Highway 85 Bridge (RM 1552). Dispersion of hatchery reared pallid sturgeon does appear to be occurring.

The greatest number of pallid sturgeon were captured in inside bend macrohabitats; whereas in 2005, pallids were sampled more often in outside bend macrohabitats. Pallid sturgeon were most frequently captured in channel border mesohabitats, followed by island tips.

Trammel nets were again the most effective gear for sampling pallid sturgeon. In 2006, 20 pallids were captured in trammel nets and seven were sampled with the otter trawl. In 2005, 24 pallid sturgeon were collected in trammel nets and the remaining seven caught in the otter trawl. Trammel nets appear to be the most effective gear for catching larger (FL>250 mm) shovelnose sturgeon; whereas the otter trawl catches more sub-stock size (FL<250 mm) shovelnose sturgeon.

It appears that pallid sturgeon use the whole reach of river from the confluence to Lake Sakakawea as they have been sampled in every bend. There is also evidence that pallid sturgeon tend to aggregate in areas of the river due to the fact that over the past two years of sampling, several pallids have been captured in subsequent subsamples after one pallid is sampled. These aggregations have been found near secondary channel island tips as well as inside and outside bend macrohabitats.

The lack of pallid sturgeon in the 650-1000 mm size is indicative of the aging adult population and the recruitment of past stocking efforts in RPMA 2. It is important to continue monitoring these stocked fish as they reach sexual maturity as well as future stockings to determine survival and success of these stocking efforts.

There was an increase in shovelnose sturgeon catch in 2006 for all gears. Three of the four size classes showed an increase in catch. Although the beam trawl was added in 2006 to target sub-stock (FL 0-149 mm) shovelnose sturgeon, there was a decrease in the number of sub-stock size class caught from 2005 to 2006. Since sampling techniques and standard gears remained the same between both years, this decrease in young of the year shovelnose sturgeon sampled may be the result of poor spawning conditions or lack of recruitment. Additional analysis and subsequent sampling should allow determination of conditions that promote sturgeon spawning success and recruitment.

Sicklefin and sturgeon chub were captured with both the otter trawl and beam trawl in 2006. Only five sturgeon chub and three sicklefin chub were sampled in mini-fyke nets. The beam trawl was as effective as the otter trawl in capturing sturgeon chubs (N = 266 BT, N = 255 OT). However, the beam trawl was less efficient than the otter trawl sampling sicklefin chubs (N = 81 BT, N = 222 OT). Sturgeon and sicklefin chubs were collected in all macrohabitats that were sampled.

The total number of sauger caught remained relatively unchanged from 2005 to 2006, with 173 sauger sampled in all gears combined in 2005 and 190 sampled in 2006. However, the addition of beam trawls and “delta” mini-fyke nets in 2006 accounted for 31 of the 190 sauger sampled. Mini-fyke nets proved to be effective at sampling smaller sauger (TL <150 mm), whereas the trammel nets appear to catch more of the larger sauger (TL >150 mm).

There was nearly a 200% increase in the number of fish sampled in 2006 versus the 2005 sampling year. Much of this increase can be attributed to the increase in emerald shiner catch in mini-fyke nets (43,623 in '06 vs. 12,125 in '05). Trammel net catch per unit effort of all targeted native Missouri River fish species was higher in 2006 versus 2005. During last year's sampling, we found that as the discharge from the Missouri and Yellowstone Rivers increased, the number of zero catches in trammel nets also increased. During the 2006 sampling season, the majority of trammel nets (78%) were deployed when discharge from the Missouri and Yellowstone Rivers was below 20,000 cfs, whereas in 2005, 37% of trammel nets were deployed below 20,000 cfs.

The initial analysis of the mini-fyke data shows that even though “ace” and “delta” nets were set in pairs in identical habitats and conditions, the standard “ace” mesh caught nearly four times the number of fish than the “delta” nets (45,271 vs. 12,418). Both nets caught the same number of species ( $N = 20$ ) with two species being unique to each net. Sicklefin chubs ( $N = 5$ ) were present only in “ace” nets and green sunfish ( $N = 2$ ) were found only in “delta” nets. The “delta” nets proved more durable than the “ace” nets. Only one of the eight “delta” nets sustained any damage, whereas all eight “ace” nets had extensive holes and tears. Further analysis of the data is needed to determine the significance of the difference between “ace” and “delta” nets.

The 6' beam trawl was used during the fish community season in 2006. The U.S. Geological Survey in Fort Peck, Montana, has been using the beam trawl to sample standardized sites in the Missouri River below the Yellowstone River confluence for the past few years. They have found it be an effective gear for sampling young of the year sturgeon (Dr. Patrick Braaten, personal communication). We wanted to determine the beam trawls effectiveness of catching young of the year sturgeon and compare the results with the standard otter trawl. A cursory look at the data shows that beam trawl captured 13 species compared to 20 species in the otter trawl. The only species unique to the beam trawl was black bullhead ( $N = 1$ ), whereas the otter trawl captured seven additional species not sampled in the beam trawl. There were no pallid sturgeon sampled in the beam trawl, while six pallids were captured in the otter trawl during fish community season, including an adult (FL 1410 mm). Catch per unit effort of sub-stock shovelnose sturgeon (FL <150 mm) was similar between the beam trawl and otter trawl (0.037 fish/100 m for the beam trawl, 0.036 fish/100 m for the otter trawl). An in depth analysis will be done to determine if there is a significant difference between the beam trawl and otter trawl.

The flexibility of the population assessment program allows for improvements in standard gears and the evaluation of new gears. For the 2007 sampling season, a new gear will be added on an experimental basis. The small mesh push trawl was developed to sample areas of the river that are too shallow to sample effectively with the otter trawl and too deep to set min-fyke nets. After the fish community season, the data will be analyzed to determine if the push trawl samples different species and sizes than the mini-fyke nets and otter trawl.

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## **APPENDICES**

Appendix A. Phylogenetic list of Missouri River fishes with corresponding letter codes used in the long-term pallid sturgeon and associated fish community sampling program. The phylogeny follows that used by the American Fisheries Society, Common and Scientific Names of Fishes from the United States and Canada, 5<sup>th</sup> edition. Asterisks and bold type denote targeted native Missouri River species.

Scientific name	Common name	Letter Code
CLASS CEPHALASPIDOMORPHI-LAMPREYS		
ORDER PETROMYZONTIFORMES		
<b>Petromyzontidae – lampreys</b>		
<i>Ichthyomyzon castaneus</i>	Chestnut lamprey	CNLP
<i>Ichthyomyzon fossor</i>	Northern brook lamprey	NBLP
<i>Ichthyomyzon unicuspis</i>	Silver lamprey	SVLP
<i>Ichthyomyzon gagei</i>	Southern brook lamprey	SBLR
Petromyzontidae	Unidentified lamprey	ULY
Petromyzontidae larvae	Unidentified larval lamprey	LVLP
CLASS OSTEICHTHYES – BONY FISHES		
ORDER ACIPENSERIFORMES		
<b>Acipenseridae – sturgeons</b>		
<i>Acipenser fulvescens</i>	Lake sturgeon	LKSG
<i>Scaphirhynchus</i> spp.	Unidentified Scaphirhynchus	USG
<b><i>Scaphirhynchus albus</i></b>	<b>Pallid sturgeon</b>	<b>PDSG*</b>
<b><i>Scaphirhynchus platyrhynchus</i></b>	<b>Shovelnose sturgeon</b>	<b>SNSG*</b>
<i>S. albus</i> X <i>S. platyrhynchus</i>	Pallid-shovelnose hybrid	SNPD
<b>Polyodontidae – paddlefishes</b>		
<i>Polyodon spathula</i>	Paddlefish	PDFH
ORDER LEPISTOSTEIFORMES		
<b>Lepisosteidae – gars</b>		
<i>Lepisosteus oculatus</i>	Spotted gar	STGR
<i>Lepisosteus osseus</i>	Longnose gar	LNGR
<i>Lepisosteus platostomus</i>	Shortnose gar	SNGR
ORDER AMMIFORMES		
<b>Amiidae – bowfins</b>		
<i>Amia calva</i>	Bowfin	BWFN
ORDER OSTEOGLOSSIFORMES		
<b>Hiodontidae – mooneyes</b>		
<i>Hiodon alosoides</i>	Goldeye	GDEY
<i>Hiodon tergisus</i>	Mooneye	MNEY
ORDER ANGUILLIFORMES		
<b>Anguillidae – freshwater eels</b>		
<i>Anguilla rostrata</i>	American eel	AMEL

# Appendix A. (continued).

Scientific name	Common name	Letter Code
<b>ORDER CLUPEIFORMES</b>		
<b>Clupeidae – herrings</b>		
<i>Alosa alabame</i>	Alabama shad	ALSD
<i>Alosa chrysochloris</i>	Skipjack herring	SJHR
<i>Alosa pseudoharengus</i>	Alewife	ALWF
<i>Dorosoma cepedianum</i>	Gizzard shad	GZSD
<i>Dorosoma petenense</i>	Threadfin shad	TFSD
<i>D. cepedianum</i> X <i>D. petenense</i>	Gizzard-threadfin shad hybrid	GSTS
<b>ORDER CYPRINIFORMES</b>		
<b>Cyprinidae – carps and minnows</b>		
<i>Campostoma anomalum</i>	Central stoneroller	CLSR
<i>Campostoma oligolepis</i>	Largescale stoneroller	LSSR
<i>Carassius auratus</i>	Goldfish	GDFH
<i>Carassius auratus</i> X <i>Cyprinus carpio</i>	Goldfish-Common carp hybrid	GFCC
<i>Couesius plumbeus</i>	Lake chub	LKCB
<i>Ctenopharyngodon idella</i>	Grass carp	GSCP
<i>Cyprinella lutrensis</i>	Red shiner	RDSN
<i>Cyprinella spiloptera</i>	Spotfin shiner	SFSN
<i>Cyprinus carpio</i>	Common carp	CARP
<i>Erimystax x-punctatus</i>	Gravel chub	GVCB
<b><i>Hybognathus argyritus</i></b>	<b>Western silvery minnow</b>	<b>WSMN*</b>
<i>Hybognathus hankinsoni</i>	Brassy minnow	BSMN
<i>Hybognathus nuchalis</i>	Mississippi silvery minnow	SVMW
<b><i>Hybognathus placitus</i></b>	<b>Plains minnow</b>	<b>PNMW*</b>
<i>Hybognathus</i> spp.	Unidentified <i>Hybognathus</i>	HBNS*
<i>Hypophthalmichthys molitrix</i>	Silver carp	SVCP
<i>Hypophthalmichthys nobilis</i>	Bighead carp	BHCP
<i>Luxilus chrysocephalus</i>	Striped shiner	SPSN
<i>Luxilus cornutus</i>	Common shiner	CMSN
<i>Luxilus zonatus</i>	Bleeding shiner	BDSN
<i>Lythrurus unbratilis</i>	Western redfin shiner	WRFS
<b><i>Macrhybopsis aestivalis</i></b>	<b>Speckled chub</b>	<b>SKCB*</b>
<b><i>Macrhybopsis gelida</i></b>	<b>Sturgeon chub</b>	<b>SGCB*</b>
<b><i>Macrhybopsis meeki</i></b>	<b>Sicklefin chub</b>	<b>SFCB*</b>
<i>Macrhybopsis storeriana</i>	Silver chub	SVCB
<i>M. aestivalis</i> X <i>M. gelida</i>	Speckled-Sturgeon chub hybrid	SPST
<i>M. gelida</i> X <i>M. meeki</i>	Sturgeon-Sicklefin chub hybrid	SCSC
<i>Macrhybopsis</i> spp.	Unidentified chub	UHY
<i>Margariscus margarita</i>	Pearl dace	PLDC
<i>Mylocheilus caurinus</i>	Peamouth	PEMT
<i>Nocomis biguttatus</i>	Hornyhead chub	HHCB
<i>Notemigonus crysoleucas</i>	Golden shiner	GDSN
<i>Notropis atherinoides</i>	Emerald shiner	ERSN
<i>Notropis blennioides</i>	River shiner	RVSN
<i>Notropis boops</i>	Bigeye shiner	BESN
<i>Notropis burchanani</i>	Ghost shiner	GTSN
<i>Notropis dorsalis</i>	Bigmouth shiner	BMSN
<i>Notropis greeni</i>	Wedgespot shiner	WSSN

# Appendix A. (continued).

Scientific name	Common name	Letter Code
<b>Cyprinidae – carps and minnows</b>		
<i>Notropis heterolepsis</i>	Blacknose shiner	BNSN
<i>Notropis hudsonius</i>	Spottail shiner	STSN
<i>Notropis nubilus</i>	Ozark minnow	OZMW
<i>Notropis rubellus</i>	Rosyface shiner	RYSN
<i>Notropis shumardi</i>	Silverband shiner	SBSN
<i>Notropis stilbius</i>	Silverstripe shiner	SSPS
<b><i>Notropis stramineus</i></b>	<b>Sand shiner</b>	<b>SNSN*</b>
<i>Notropis topeka</i>	Topeka shiner	TPSN
<i>Notropis volucellus</i>	Mimic shiner	MMSN
<i>Notropis wickliffi</i>	Channel shiner	CNSN
<i>Notropis</i> spp.	Unidentified shiner	UNO
<i>Opsopoeodus emiliae</i>	Pugnose minnow	PNMW
<i>Phenacobius mirabilis</i>	Suckermouth minnow	SMMW
<i>Phoxinus eos</i>	Northern redbelly dace	NRBD
<i>Phoxinus erythrogaster</i>	Southern redbelly dace	SRBD
<i>Phoxinus neogaeus</i>	Finescale dace	FSDC
<i>Pimephales notatus</i>	Bluntnose minnow	BNMW
<i>Pimephales promelas</i>	Fathead minnow	FHMW
<i>Pimephales vigilax</i>	Bullhead minnow	BHMW
<i>Platygobio gracilis</i>	Flathead chub	FHCB
<i>P. gracilis</i> X <i>M. meeki</i>	Flathead-sicklefin chub hybrid	FCSC
<i>Rhinichthys atratulus</i>	Blacknose dace	BNDC
<i>Rhinichthys cataractae</i>	Longnose dace	LNDC
<i>Richardsonius balteatus</i>	Redside shiner	RDSS
<i>Scardinius erythrophthalmus</i>	Rudd	RUDD
<i>Semotilus atromaculatus</i>	Creek chub	CKCB
	Unidentified Cyprinidae	UCY
	Unidentified Asian Carp	UAC
<b>Catostomidae - suckers</b>		
<i>Carpiodes carpio</i>	River carpsucker	RVCS
<i>Carpiodes cyprinus</i>	Quillback	QLBK
<i>Carpiodes velifer</i>	Highfin carpsucker	HFCS
<i>Carpiodes</i> spp.	Unidentified Carpiodes	UCS
<i>Catostomus catostomus</i>	Longnose sucker	LNSK
<i>Catostomus commersoni</i>	White sucker	WTSK
<i>Catostomus platyrhynchus</i>	Mountain sucker	MTSK
<i>Catostomus</i> spp.	Unidentified <i>Catostomus</i> spp.	UCA
<b><i>Cycleptus elongatus</i></b>	<b>Blue sucker</b>	<b>BUSK*</b>
<i>Hypentelium nigricans</i>	Northern hog sucker	NHSC
<i>Ictiobus bubalus</i>	Smallmouth buffalo	SMBF
<i>Ictiobus cyprinellus</i>	Bigmouth buffalo	BMBF
<i>Ictiobus niger</i>	Black buffalo	BKBF
<i>Ictiobus</i> spp.	Unidentified buffalo	UBF
<i>Minytrema melanops</i>	Spotted sucker	SPSK
<i>Moxostoma anisurum</i>	Silver redhorse	SVRH
<i>Moxostoma carinatum</i>	River redhorse	RVRH
<i>Moxostoma duquesnei</i>	Black redhorse	BKRH
<i>Moxostoma erythrurum</i>	Golden redhorse	GDRH
<i>Moxostoma macrolepidotum</i>	Shorthead redhorse	SHRH
<i>Moxostoma</i> spp.	Unidentified redhorse	URH

Appendix A. (continued).

Scientific name	Common name	Letter Code
<b>Catostomidae - suckers</b>	Unidentified Catostomidae	UCT
<b>ORDER SILURIFORMES</b>		
<b>Ictaluridae – bullhead catfishes</b>		
<i>Ameiurus melas</i>	Black bullhead	BKBH
<i>Ameiurus natalis</i>	Yellow bullhead	YLBH
<i>Ameiurus nebulosus</i>	Brown bullhead	BRBH
<i>Ameiurus</i> spp.	Unidentified bullhead	UBH
<i>Ictalurus furcatus</i>	Blue catfish	BLCF
<i>Ictalurus punctatus</i>	Channel catfish	CNCF
<i>I. furcatus</i> X <i>I. punctatus</i>	Blue-channel catfish hybrid	BCCC
<i>Ictalurus</i> spp.	Unidentified <i>Ictalurus</i> spp.	UCF
<i>Noturus exilis</i>	Slender madtom	SDMT
<i>Noturus flavus</i>	Stonecat	STCT
<i>Noturus gyrinus</i>	Tadpole madtom	TPMT
<i>Noturus nocturnus</i>	Freckled madtom	FKMT
<i>Pylodictis olivaris</i>	Flathead catfish	FHCF
<b>ORDER SALMONIFORMES</b>		
<b>Esocidae - pikes</b>		
<i>Esox americanus vermiculatus</i>	Grass pickerel	GSPK
<i>Esox lucius</i>	Northern pike	NTPK
<i>Esox masquinongy</i>	Muskellunge	MSKG
<i>E. lucius</i> X <i>E. masquinongy</i>	Tiger Muskellunge	TGMG
<b>Umbridae - mudminnows</b>		
<i>Umbra limi</i>	Central mudminnow	MDMN
<b>Osmeridae - smelts</b>		
<i>Osmerus mordax</i>	Rainbow smelt	RBST
<b>Salmonidae - trouts</b>		
<i>Coregonus artedii</i>	Lake herring or cisco	CSCO
<i>Coregonus clupeaformis</i>	Lake whitefish	LKWF
<i>Oncorhynchus aguabonita</i>	Golden trout	GDTT
<i>Oncorhynchus clarki</i>	Cutthroat trout	CTTT
<i>Oncorhynchus kisutch</i>	Coho salmon	CHSM
<i>Oncorhynchus mykiss</i>	Rainbow trout	RBTT
<i>Oncorhynchus nerka</i>	Sockeye salmon	SESM
<i>Oncorhynchus tshawytscha</i>	Chinook salmon	CNSM
<i>Prosopium cylindraceum</i>	Bonneville cisco	BVSC
<i>Prosopium williamsoni</i>	Mountain whitefish	MTWF
<i>Salmo trutta</i>	Brown trout	BNTT
<i>Salvelinus fontinalis</i>	Brook trout	BKTT
<i>Salvelinus namaycush</i>	Lake trout	LKTT
<i>Thymallus arcticus</i>	Arctic grayling	AMGL

Appendix A. (continued).

Scientific name	Common name	Letter Code
<b>ORDER PERCOPSIFORMES</b>		
<b>Percopsidae – trout-perches</b>		
<i>Percopsis omiscomaycus</i>	Trout-perch	TTPH
<b>ORDER GADIFORMES</b>		
<b>Gadidae - cods</b>		
<i>Lota lota</i>	Burbot	BRBT
<b>ORDER ATHERINIFORMES</b>		
<b>Cyprinodontidae - killifishes</b>		
<i>Fundulus catenatus</i>	Northern studfish	NTSF
<i>Fundulus diaphanus</i>	Banded killifish	BDKF
<i>Fundulus notatus</i>	Blackstripe topminnow	BSTM
<i>Fundulus olivaceus</i>	Blackspotted topminnow	BPTM
<i>Fundulus sciadicus</i>	Plains topminnow	PTMW
<i>Fundulus zebrinus</i>	Plains killifish	PKLF
<b>Poeciliidae - livebearers</b>		
<i>Gambusia affinis</i>	Western mosquitofish	MQTF
<b>Atherinidae - silversides</b>		
<i>Labidesthes sicculus</i>	Brook silverside	BKSS
<b>ORDER GASTEROSTEIFORMES</b>		
<b>Gasterosteidae - sticklebacks</b>		
<i>Culaea inconstans</i>	Brook stickleback	BKSB
<b>ORDER SCORPAENIFORMES</b>		
<b>Cottidae - sculpins</b>		
<i>Cottus bairdi</i>	Mottled sculpin	MDSP
<i>Cottus carolinae</i>	Banded sculpin	BDSP
<b>ORDER PERCIFORMES</b>		
<b>Percichthyidae – temperate basses</b>		
<i>Morone Americana</i>	White perch	WTPH
<i>Morone chrysops</i>	White bass	WTBS
<i>Morone mississippiensis</i>	Yellow bass	YWBS
<i>Morone saxatilis</i>	Striped bass	SDBS
<i>M. saxatilis X M. chrysops</i>	Striped-white bass hybrid	SBWB
<b>Centrarchidae - sunfishes</b>		
<i>Ambloplites rupestris</i>	Rock bass	RKBS
<i>Archoplites interruptus</i>	Sacramento perch	SOPH
<i>Lepomis cyanellus</i>	Green sunfish	GNSF
<i>Lepomis gibbosus</i>	Pumpkinseed	PNSD
<i>Lepomis gulosus</i>	Warmouth	WRMH
<i>Lepomis humilis</i>	Orangespotted sunfish	OSSF
<i>Lepomis macrochirus</i>	Bluegill	BLGL
<i>Lepomis magalotis</i>	Longear sunfish	LESF
<i>Lepomis microlophus</i>	Redear sunfish	RESF
<i>L. cyanellus X L. macrochirus</i>	Green sunfish-bluegill hybrid	GSBG

# Appendix A. (continued).

Scientific name	Common name	Letter Code
<b>Centrarchidae - sunfishes</b>		
<i>L. cyanellus</i> X <i>L. humilis</i>	Green-orangespotted sunfish hybrid	GSOS
<i>L. macrochirus</i> X <i>L. microlophus</i>	Bluegill-redear sunfish hybrid	BGRE
<i>Lepomis</i> spp.	Unidentified <i>Lepomis</i>	ULP
<i>Micropterus dolomieu</i>	Smallmouth bass	SMBS
<i>Micropterus punctulatus</i>	Spotted sunfish	STBS
<i>Micropterus salmoides</i>	Largemouth bass	LMBS
<i>Micropterus</i> spp.	Unidentified <i>Micropterus</i> spp.	UMC
<i>Pomoxis annularis</i>	White crappie	WTCP
<i>Pomoxis nigromaculatus</i>	Black crappie	BKCP
<i>Pomoxis</i> spp.	Unidentified crappie	UCP
<i>P. annularis</i> X <i>P. nigromaculatus</i>	White-black crappie hybrid	WCBC
Centrarchidae	Unidentified centrarchid	UCN
<b>Percidae - perches</b>		
<i>Ammocrypta asprella</i>	Crystal darter	CLDR
<i>Etheostoma blennioides</i>	Greenside darter	GS DR
<i>Etheostoma caeruleum</i>	Rainbow darter	RBDR
<i>Etheostoma exile</i>	Iowa darter	IODR
<i>Etheostoma flabellare</i>	Fantail darter	FTDR
<i>Etheostoma gracile</i>	Slough darter	SLDR
<i>Etheostoma microperca</i>	Least darter	LTDR
<i>Etheostoma nigrum</i>	Johnny darter	JYDR
<i>Etheostoma punctulatum</i>	Stippled darter	STPD
<i>Etheostoma spectabile</i>	Orangethroated darter	OTDR
<i>Etheostoma tetrazonum</i>	Missouri saddled darter	MSDR
<i>Etheostoma zonale</i>	Banded darter	BDDR
<i>Etheostoma</i> spp.	Unidentified <i>Etheostoma</i> spp.	UET
<i>Perca flavescens</i>	Yellow perch	YWPH
<i>Percina caprodes</i>	Logperch	LGPH
<i>Percina cymatotaenia</i>	Bluestripe darter	BTDR
<i>Percina evides</i>	Gilt darter	GLDR
<i>Percina maculata</i>	Blackside darter	BSDR
<i>Percina phoxocephala</i>	Slenderhead darter	SHDR
<i>Percina shumardi</i>	River darter	RRDR
<i>Percina</i> spp.	Unidentified <i>Percina</i> spp.	UPN
	Unidentified darter	UDR
<b><i>Sander canadense</i></b>	<b>Sauger</b>	<b>SGER*</b>
<i>Sander vitreus</i>	Walleye	WLEY
<i>S. canadense</i> X <i>S. vitreus</i>	Sauger-walley hybrid/Saugeye	SGWE
<i>Sander</i> spp.	Unidentified <i>Sander</i> (formerly <i>Stizostedion</i> ) spp.	UST
	Unidentified Percidae	UPC
<b>Sciaenidae - drums</b>		
<i>Aplodinotus grunniens</i>	Freshwater drum	FWDM
<b>NON-TAXONOMIC CATEGORIES</b>		
	Age-0/Young-of-year fish	YOYF
	Lab fish for identification	LAB
	No fish caught	NFSH
	Unidentified larval fish	LVFS
	Unidentified	UNID
	Net Malfunction (Did Not Fish)	NDNF

Appendix B. Definitions and codes used to classify standard Missouri River habitats in the long-term pallid sturgeon and associated fish community sampling program. Three habitat scales were used in the hierarchical habitat classification system: Macrohabitats, Mesohabitats, and Microhabitats.

Habitat	Scale	Definition	Code
Braided channel	Macro	An area of the river that contains multiple smaller channels and is lacking a readily identifiable main channel (typically associated with unchannelized sections)	BRAD
Main channel cross over	Macro	The inflection point of the thalweg where the thalweg crosses from one concave side of the river to the other concave side of the river, (i.e., transition zone from one-bend to the next bend). The upstream CHXO for a respective bend is the one sampled.	CHXO
Tributary confluence	Macro	Area immediately downstream, extending up to one bend in length, from a junction of a large tributary and the main river where this tributary has influence on the physical features of the main river	CONF
Dendritic	Macro	An area of the river where the river transitions from meandering or braided channel to more of a treelike pattern with multiple channels (typically associated with unchannelized sections)	DEND
Deranged	Macro	An area of the river where the river transitions from a series of multiple channels into a meandering or braided channel (typically associated with unchannelized sections)	DRNG
Main channel inside bend	Macro	The convex side of a river bend	ISB
Main channel outside bend	Macro	The concave side of a river bend	OSB
Secondary channel-connected large	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, large indicates this habitat can be sampled with trammel nets and trawls based on width and/or depths > 1.2 m	SCCL
Secondary channel-connected small	Macro	A side channel, open on upstream and downstream ends, with less flow than the main channel, small indicates this habitat cannot be sampled with trammel nets and trawls based on width and/or on depths < 1.2 m	SCCS
Secondary channel-non-connected	Macro	A side channel that is blocked at one end	SCCN
Tributary	Macro	Any river or stream flowing in the Missouri River	TRIB
Tributary large mouth	Macro	Mouth of entering tributary whose mean annual discharge is > 20 m <sup>3</sup> /s, and the sample area extends 300 m into the tributary	TRML
Tributary small mouth	Macro	Mouth of entering tributary whose mean annual discharge is < 20 m <sup>3</sup> /s, mouth width is > 6 m wide and the sample area extends 300 m into the tributary	TRMS
Wild	Macro	All habitats not covered in the previous habitat descriptions	WILD
Bars	Meso	Sandbar or shallow bank-line areas with depth < 1.2 m	BARS
Pools	Meso	Areas immediately downstream from sandbars, dikes, snags, or other obstructions with a formed scour hole > 1.2 m	POOL
Channel border	Meso	Area in the channelized river between the toe and the thalweg, area in the unchannelized river between the toe and the maximum depth	CHNB
Thalweg	Meso	Main channel between the channel borders conveying the majority of the flow	TLWG
Island tip	Meso	Area immediately downstream of a bar or island where two channels converge with water depths > 1.2 m	ITIP

Appendix C. List of standard and wild gears (type), their corresponding codes in the database, seasons deployed (Fall-Spring, Summer, or all), years used, and catch-per-unit-effort units for collection of Missouri River fishes in segment **xx** for the long-term pallid sturgeon and associated fish community sampling program. Long-term monitoring began in 20**xx** for segment **xx**.

Gear	Code	Type	Season	Years	CPUE units
Trammel net – 1 inch inner mesh	TN	Standard	All	2003 - Present	fish/100 m drift
Trammel net – 2.5 inch inner mesh	TN25	Standard	Sturgeon	2005 - Present	fish/100 m drift
Gillnet – 4 meshes, small mesh set upstream	GN14	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 4 meshes, large mesh set upstream	GN41	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, small mesh set upstream	GN18	Standard	Sturgeon	2003 - Present	fish/net night
Gillnet – 8 meshes, large mesh set upstream	GN81	Standard	Sturgeon	2003 - Present	fish/net night
Otter trawl – 16 ft head rope	OT16	Standard	All	2003 - Present	fish/100 m trawled
Otter trawl – 16 ft SKT 4mm x 4mm HB2 MOR	OT01	Wild	Fish Comm.	2006 - Present	fish/100 m trawled
Push Trawl – 8 ft 4mm x 4mm	POT02	Wild	Fish Comm.	2006 - Present	fish/ m trawled
Beam trawl	BT	Standard*	All	2003 - 2004	fish/100 m trawled
Bag Seine – quarter arc method pulled upstream	BSQU	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Bag Seine – quarter arc method pulled downstream	BSQD	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Bag Seine – half arc method pulled upstream	BSHU	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Bag Seine – half arc method pulled downstream	BSHD	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Bag seine – rectangular method pulled upstream	BSRU	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Bag seine – rectangular method pulled upstream	BSRD	Wild	Fish Comm.	2003 - Present	fish/100 m <sup>2</sup>
Mini-fyke net	MF	Standard	Fish Comm.	2003 - Present	fish/net night

\* Standard only in upper Missouri River segments

Appendix D. Stocking locations and codes for pallid sturgeon by Recovery Priority Management Area (RPMA) in the Missouri River Basin.

State(s)	RPMA	Site Name	Code	River	RM
MT	2	Above Intake	AIN	Yellowstone	70 +
MT	2	Intake	INT	Yellowstone	70.0
MT	2	Sidney	SID	Yellowstone	31.0
MT	2	Big Sky Bend	BSB	Yellowstone	17.0
ND	2	Fairview	FRV	Yellowstone	9.0
MT	2	Milk River	MLK	Milk	11.5
MT	2	Mouth of Milk	MOM	Missouri	1761.5
MT	2	Wolf Point	WFP	Missouri	1701.5
MT	2	Poplar	POP	Missouri	1649.5
MT	2	Brockton	BRK	Missouri	1678.0
MT	2	Culbertson	CBS	Missouri	1621.0
MT	2	Nohly Bridge	NOB	Missouri	1590.0
ND	2	Confluence	CON	Missouri	1581.5
SD/NE	3	Sunshine Bottom	SUN	Missouri	866.2
SD/NE	3	Verdel Boat Ramp	VER	Missouri	855.0
SD/NE	3	Standing Bear Bridge	STB	Missouri	845.0
SD/NE	3	Running Water	RNW	Missouri	840.1
SD/NE	4	St. Helena	STH	Missouri	799.0
SD/NE	4	Mullberry Bend	MUL	Missouri	775.0
NE/IA	4	Ponca State Park	PSP	Missouri	753.0
NE/IA	4	Sioux City	SIO	Missouri	732.6
NE/IA	4	Decatur	DCT	Missouri	691.0
NE/IA	4	Boyer Chute	BYC	Missouri	637.4
NE/IA	4	Bellevue	BEL	Missouri	601.4
NE/IA	4	Rulo	RLO	Missouri	497.9
NE/MO/KS	4	Kansas River	KSR	Missouri	367.5
NE	4	Platte River	PLR	Platte	5.0
KA/MO	4	Leavenworth	LVW	Missouri	397.0
MO	4	Parkville	PKV	Missouri	377.5
MO	4	Kansas City	KAC	Missouri	342.0
MO	4	Miami	MIA	Missouri	262.8
MO	4	Grand River	GDR	Missouri	250.0
MO	4	Boonville	BOO	Missouri	195.1
MO	4	Overton	OVT	Missouri	185.1
MO	4	Hartsburg	HAR	Missouri	160.0
MO	4	Jefferson City	JEF	Missouri	143.9
MO	4	Mokane	MOK	Missouri	124.7
MO	4	Hermann	HER	Missouri	97.6
MO	4	Washington	WAS	Missouri	68.5
MO	4	St. Charles	STC	Missouri	28.5

Appendix E. Juvenile and adult pallid sturgeon stocking summary for segment 4 of the Missouri River (RPMA 2)

Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking <sup>a</sup>	Primary Mark	Secondary Mark
1998	Big Sky Bend	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Confluence	40	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Nohly Bridge	255	1997	8/11/1998	Yearling	PIT Tag	Elastomer
1998	Sidney	230	1997	8/11/1998	Yearling	PIT Tag	Elastomer
2000	Culbertson	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Fairview	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Sidney	66	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Wolf Point	34	1998	10/11/2000	2 yr Old	PIT Tag	
2000	Culbertson	89	1999	10/17/2000	Yearling	PIT Tag	
2000	Fairview	150	1999	10/17/2000	Yearling	PIT Tag	
2000	Sidney	149	1999	10/17/2000	Yearling	PIT Tag	
2000	Wolf Point	90	1999	10/17/2000	Yearling	PIT Tag	
2002	Culbertson	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Fairview	270	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Intake	199	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Sidney	271	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Wolf Point	269	2001	7/18/2002	Yearling	CWT	Elastomer
2002	Culbertson	317	2001	7/26/2002	Yearling	PIT Tag	
2002	Fairview	360	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	97	2001	7/26/2002	Yearling	PIT Tag	
2002	Sidney	427	2001	7/26/2002	Yearling	PIT Tag	
2002	Wolf Point	425	2001	7/26/2002	Yearling	PIT Tag	
2002	Intake	155	2001	9/18/2002	Yearling	PIT Tag	
2003	Culbertson	1033	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2003	Fairview	887	2002	8/7/2003	Yearling	PIT Tag	Elastomer
Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking <sup>a</sup>	Primary Mark	Secondary Mark
2003	Intake	1040	2002	8/7/2003	Yearling	PIT Tag	Elastomer

2003	Wolf Point	926	2002	8/7/2003	Yearling	PIT Tag	Elastomer
2004	Milk River	821	2003	4/13/2004	Yearling	Elastomer	
2004	Culbertson	523	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Intake	347	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Sidney	397	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Wolf Point	379	2003	8/9/2004	Yearling	PIT Tag	Elastomer
2004	Larval Drift	30000	2004	7/2/2004	Fry		
2004	Larval Drift	50000	2004	7/8/2004	Fry		
2004	Larval Drift	25000	2004	7/20/2004	Fry		
2004	Larval Drift	25000	2004	7/23/2004	Fry		
2004	Larval Drift	25000	2004	7/27/2004	Fry		
2004	Culbertson	3819	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Sidney	2991	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Wolf Point	4040	2004	9/10/2004	Fingerling	CWT	Elastomer
2004	Mouth of Milk	3482	2004	10/15/2004	Advanced Fingerling	CWT	Elastomer
2004	Intake	2477	2004	11/18/2004	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	288	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	309	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Wolf Point	271	2004	4/12/2005	Yearling	CWT	Elastomer
2005	Intake	175	2004	8/19/2005	Yearling	PIT Tag	Elastomer
2005	Brockton	229	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	226	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	456	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	232	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	122	2005	10/5/2005	Advanced Fingerling	CWT	Elastomer
Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking <sup>a</sup>	Primary Mark	Secondary Mark
2005	Wolf Point	611	2005	10/12/2005	Advanced Fingerling	CWT	Elastomer
2005	Brockton	371	2005	10/13/2005	Advanced fingerling		

2005	Culbertson	1736	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Culbertson	182	2005	10/13/2005	Advanced Fingerling		
2005	Intake	313	2005	10/13/2005	Advanced Fingerling		
2005	Milk River	845	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Mouth of Milk	371	2005	10/13/2005	Advanced Fingerling		
2005	Sidney	105	2005	10/13/2005	Advanced Fingerling		
2005	Wolf Point	1521	2005	10/13/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	371	2005	10/13/2005	Advanced Fingerling		
2005	Culbertson	651	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Intake	2120	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Milk River	485	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Sidney	882	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2005	Wolf Point	650	2005	10/19/2005	Advanced Fingerling	CWT	Elastomer
2006	Culbertson	235	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	327	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Mouth of Milk	134	2005	3/28/2006	Advanced fingerling	Elastomer	
2006	Sidney	113	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	232	2005	3/28/2006	Advanced Fingerling	Elastomer	
2006	Intake	970	2005	4/3/2006	Yearling	PIT Tag	Elastomer
2006	Sidney	314	2005	4/3/2006	Yearling	PIT Tag	Elastomer
2006	Culbertson	844	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Mouth of Milk	1007	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Wolf Point	866	2005	4/5/2006	Yearling	PIT Tag	Elastomer
2006	Culbertson	669	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
Year	Stocking Site	Number Stocked	Year Class	Stock Date	Age at Stocking <sup>a</sup>	Primary Mark	Secondary Mark
2006	Intake	765	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Mouth of Milk	650	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Sidney	228	2005	5/1/2006	Yearling	PIT Tag	Scute Removed

2006	Wolf Point	653	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006		1355	2005	5/1/2006	Yearling	PIT Tag	Scute Removed
2006	Culbertson	1544	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Intake	1680	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Mouth Milk	1117	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Sidney	586	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	Wolf Point	1553	2006	10/24/2006	Advanced Fingerling	Elastomer	
2006	School Trust	436	2006	11/8/2006	Advanced Fingerling	Elastomer	

<sup>a</sup>Age of fish when stocked: Fry, Fingerling, Yearling, 1yo, 2yo, 3yo, etc...

## **Appendix F**

Total catch, overall mean catch per unit effort [ $\pm 2$  SE], and mean CPUE (fish/100 m) by Mesohabitat within a Macrohabitat for all species caught with each gear type during sturgeon season and fish community season for segment 4 of the Missouri River during 2005-2006. Species captured are listed alphabetically and their codes are presented in Appendix A. Asterisks with bold type indicate targeted native Missouri River species and habitat abbreviations are presented in Appendix B. Standard Error was not calculated when  $N < 2$ .

Appendix F1. Gill Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors in brackets.

Gear Not Used

Appendix F2. 1 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	BARS	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BKBH	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
BMBF	9	0.021 [0.018]	0.006 [0.012]	N-E	0 [0]	N-E	0.041 [0.043]	0.041 [0.043]	0.018 [0.037]	N-E	0 [0]	0 [0]	0 [0]	N-E
BRBT	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>BUSK*</b>	<b>10</b>	<b>0.027</b> <b>[0.033]</b>	<b>0.078</b> <b>[0.131]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.006</b> <b>[0.012]</b>	<b>0</b> <b>[0]</b>	<b>0.018</b> <b>[0.037]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0.077</b> <b>[0.154]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
CARP	6	0.015 [0.013]	0.014 [0.028]	N-E	0 [0]	N-E	0.028 [0.029]	0 [0]	0.007 [0.013]	N-E	0 [0]	0 [0]	0 [0]	N-E
CNCF	152	0.392 [0.307]	0.901 [1.225]	N-E	0 [0]	N-E	0.252 [0.122]	0 [0]	0.266 [0.221]	N-E	0 [0]	0 [0]	0.202 [0.276]	N-E
ERSN	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
FHMW	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
FWDM	2	0.005 [0.007]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
GDEY	54	0.14 [0.061]	0.116 [0.096]	N-E	0 [0]	N-E	0.164 [0.141]	0 [0]	0.016 [0.022]	N-E	0 [0]	0.129 [0.178]	0.197 [0.205]	N-E
<b>HBNS*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
NTPK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
PDFH	3	0.008 [0.009]	0.021 [0.032]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0.046 [0.092]	0 [0]	N-E
<b>PDSG*</b>	<b>17</b>	<b>0.041</b> <b>[0.023]</b>	<b>0.033</b> <b>[0.04]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.06</b> <b>[0.047]</b>	<b>0</b> <b>[0]</b>	<b>0.023</b> <b>[0.034]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0.119</b> <b>[0.173]</b>	<b>N-E</b>
RVCS	7	0.012 [0.01]	0.015 [0.021]	N-E	0 [0]	N-E	0.024 [0.024]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>SFCB*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
<b>SGCB*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>

Appendix F2 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	BARS	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
<b>SGER*</b>	<b>66</b>	<b>0.159</b> <b>[0.054]</b>	<b>0.199</b> <b>[0.134]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.169</b> <b>[0.095]</b>	<b>1.796</b> <b>[0]</b>	<b>0.076</b> <b>[0.047]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0.218</b> <b>[0.313]</b>	<b>0.21</b> <b>[0.187]</b>	<b>N-E</b>
SGWE	2	0.004 [0.006]	0.007 [0.015]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.009 [0.018]	N-E	0 [0]	0 [0]	0 [0]	N-E
SHRH	9	0.024 [0.025]	0.008 [0.016]	N-E	0 [0]	N-E	0.004 [0.009]	0 [0]	0.063 [0.08]	N-E	0 [0]	0 [0]	0.035 [0.069]	N-E
SMBF	7	0.014 [0.012]	0.019 [0.027]	N-E	0 [0]	N-E	0.024 [0.03]	0 [0]	0.004 [0.009]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>SNSG*</b>	<b>254</b>	<b>0.617</b> <b>[0.142]</b>	<b>0.822</b> <b>[0.408]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.533</b> <b>[0.188]</b>	<b>0</b> <b>[0]</b>	<b>0.581</b> <b>[0.241]</b>	<b>N-E</b>	<b>0.287</b> <b>[0.575]</b>	<b>0.368</b> <b>[0.277]</b>	<b>0.836</b> <b>[0.64]</b>	<b>N-E</b>
<b>SNSN*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
STCT	2	0.006 [0.008]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.019 [0.027]	N-E	0 [0]	0 [0]	0 [0]	N-E
UNID	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
USG	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WLYE	12	0.022 [0.016]	0.008 [0.017]	N-E	0 [0]	N-E	0.027 [0.032]	0 [0]	0.037 [0.036]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTBS	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTCP	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTSK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E

Appendix F3. 2.5 Inch Trammel Net: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Gear Not Used

Appendix F4. Otter Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BKBH	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
BMBF	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
BRBT	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
<b>BUSK*</b>	<b>2</b>	<b>0.004</b> <b>[0.006]</b>	<b>0</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0.014</b> <b>[0.02]</b>	<b>N-E</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>N-E</b>
CARP	4	0.01 [0.011]	0	N-E	0	N-E	0.018 [0.02]	N-E	0	N-E	0	0	0.066 [0.133]	N-E
CNCF	713	1.683 [0.745]	0.985 [0.536]	N-E	0	N-E	1.515 [0.774]	N-E	0.857 [0.393]	N-E	0	0.981 [1.056]	10.55 [9.937]	N-E
ERSN	16	0.029 [0.02]	0.039 [0.052]	N-E	0	N-E	0.045 [0.041]	N-E	0.016 [0.024]	N-E	0	0	0	N-E
FHCB	45	0.084 [0.039]	0.057 [0.043]	N-E	0	N-E	0.066 [0.035]	N-E	0.056 [0.059]	N-E	0.704 [0.791]	0.109 [0.143]	0.069 [0.139]	N-E
FHMW	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
FWDM	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
GDEY	17	0.029 [0.029]	0.01 [0.02]	N-E	0	N-E	0.039 [0.058]	N-E	0.005 [0.01]	N-E	0.375 [0.618]	0	0.197 [0.205]	N-E
<b>HBNS*</b>	<b>2</b>	<b>0.004</b> <b>[0.007]</b>	<b>0</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0.011</b> <b>[0.023]</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>N-E</b>
NTPK	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
PDFH	0	0 [0]	0	N-E	0	N-E	0	N-E	0	N-E	0	0	0	N-E
<b>PDSG*</b>	<b>7</b>	<b>0.014</b> <b>[0.012]</b>	<b>0.033</b> <b>[0.041]</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0.011</b> <b>[0.016]</b>	<b>N-E</b>	<b>0.007</b> <b>[0.015]</b>	<b>N-E</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>N-E</b>
RVCS	8	0.014 [0.01]	0.019 [0.022]	N-E	0	N-E	0.017 [0.019]	N-E	0	N-E	0.049 [0.098]	0	0.034 [0.069]	N-E
<b>SFCB*</b>	<b>222</b>	<b>0.411</b> <b>[0.088]</b>	<b>0.431</b> <b>[0.151]</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0.395</b> <b>[0.14]</b>	<b>N-E</b>	<b>0.428</b> <b>[0.203]</b>	<b>N-E</b>	<b>0.712</b> <b>[0.462]</b>	<b>0.208</b> <b>[0.298]</b>	<b>0.283</b> <b>[0.305]</b>	<b>N-E</b>
<b>SGCB*</b>	<b>255</b>	<b>0.474</b> <b>[0.13]</b>	<b>0.467</b> <b>[0.165]</b>	<b>N-E</b>	<b>0</b>	<b>N-E</b>	<b>0.633</b> <b>[0.342]</b>	<b>N-E</b>	<b>0.282</b> <b>[0.135]</b>	<b>N-E</b>	<b>0.646</b> <b>[0.392]</b>	<b>0.348</b> <b>[0.475]</b>	<b>0.561</b> <b>[0.46]</b>	<b>N-E</b>

Appendix F4 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
<b>SGER*</b>	<b>18</b>	<b>0.033</b> <b>[0.016]</b>	<b>0.027</b> <b>[0.026]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.043</b> <b>[0.031]</b>	<b>1.796</b> <b>[0]</b>	<b>0.006</b> <b>[0.011]</b>	<b>N-E</b>	<b>0.16</b> <b>[0.214]</b>	<b>0.155</b> <b>[0.204]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
SGWE	2	0.004 [0.006]	0.01 [0.02]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.007 [0.013]	N-E	0 [0]	0 [0]	0 [0]	N-E
SHRH	3	0.006 [0.01]	0 [0]	N-E	0 [0]	N-E	0.007 [0.013]	0 [0]	0 [0]	N-E	0 [0]	0.128 [0.255]	0 [0]	N-E
SMBF	9	0.021 [0.015]	0.008 [0.017]	N-E	0 [0]	N-E	0.016 [0.018]	0 [0]	0.011 [0.016]	N-E	0.067 [0.135]	0 [0]	0.133 [0.181]	N-E
<b>SNSG*</b>	<b>89</b>	<b>0.175</b> <b>[0.045]</b>	<b>0.193</b> <b>[0.106]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.195</b> <b>[0.075]</b>	<b>0</b> <b>[0]</b>	<b>0.11</b> <b>[0.063]</b>	<b>N-E</b>	<b>0.234</b> <b>[0.173]</b>	<b>0.064</b> <b>[0.128]</b>	<b>0.339</b> <b>[0.277]</b>	<b>N-E</b>
<b>SNSN*</b>	<b>1</b>	<b>0.002</b> <b>[0.004]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0.006</b> <b>[0.012]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
STCT	66	0.117 [0.119]	0.048 [0.059]	N-E	0 [0]	N-E	0.036 [0.037]	0 [0]	0.297 [0.397]	N-E	0.049 [0.098]	0.045 [0.09]	0.052 [0.104]	N-E
UNID	3	0.005 [0.006]	0.007 [0.014]	N-E	0 [0]	N-E	0.006 [0.012]	0 [0]	0 [0]	N-E	0.049 [0.098]	0 [0]	0 [0]	N-E
USG	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WLYE	1	0.002 [0.004]	0 [0]	N-E	0 [0]	N-E	0.006 [0.012]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTBS	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTCP	5	0.011 [0.014]	0.008 [0.017]	N-E	0 [0]	N-E	0.02 [0.04]	0 [0]	0 [0]	N-E	0.062 [0.123]	0 [0]	0 [0]	N-E
WTSK	1	0.002 [0.003]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.006 [0.012]	N-E	0 [0]	0 [0]	0 [0]	N-E

Appendix F5. Beam Trawl: overall season and segment summary. Lists CPUE (fish/100 m) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
BKBH	1	0.004 [0.008]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0.012 [0.024]	N-E	0 [0]	0 [0]	0 [0]	N-E
BMBF	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
BRBT	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>BUSK*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
CARP	2	0.01 [0.014]	0 [0]	N-E	0 [0]	N-E	0.012 [0.024]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.147 [0.294]	N-E
CNCF	325	1.433 [0.43]	1.351 [0.846]	N-E	0 [0]	N-E	1.765 [0.766]	N-E	1.071 [0.709]	N-E	0.624 [0.222]	3.898 [6.569]	1.334 [1.887]	N-E
ERSN	6	0.022 [0.027]	0.03 [0.06]	N-E	0 [0]	N-E	0.044 [0.047]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
FHCB	18	0.069 [0.06]	0.029 [0.04]	N-E	0 [0]	N-E	0.068 [0.052]	N-E	0.02 [0.041]	N-E	0.256 [0.513]	0 [0]	0.67 [1.341]	N-E
FHMW	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
FWDM	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
GDEY	2	0.009 [0.012]	0.015 [0.03]	N-E	0 [0]	N-E	0.015 [0.029]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>HBNS*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
NTPK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
PDFH	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>PDSG*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
RVCS	1	0.004 [0.008]	0 [0]	N-E	0 [0]	N-E	0 [0]	N-E	0.013 [0.025]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>SFCB*</b>	<b>81</b>	<b>0.378</b> <b>[0.121]</b>	<b>0.261</b> <b>[0.176]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.318</b> <b>[0.176]</b>	<b>N-E</b>	<b>0.378</b> <b>[0.185]</b>	<b>N-E</b>	<b>1.838</b> <b>[3.676]</b>	<b>0.89</b> <b>[0.675]</b>	<b>0.598</b> <b>[0.514]</b>	<b>N-E</b>
<b>SGCB*</b>	<b>266</b>	<b>1.09</b> <b>[0.326]</b>	<b>0.88</b> <b>[0.378]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>1.674</b> <b>[0.822]</b>	<b>N-E</b>	<b>0.692</b> <b>[0.346]</b>	<b>N-E</b>	<b>0.735</b> <b>[1.471]</b>	<b>1.688</b> <b>[2.149]</b>	<b>0.694</b> <b>[0.496]</b>	<b>N-E</b>

Appendix F5 (continued).

Species	Total Catch	Overall CPUE	CHXO		CONF		ISB		OSB		SCCL		SCCS	TRML
			CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	POOL	CHNB	ITIP	ITIP	TLWG
<b>SGER*</b>	<b>6</b>	<b>0.024</b> <b>[0.029]</b>	<b>0.015</b> <b>[0.029]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.039</b> <b>[0.078]</b>	<b>1.796</b> <b>[0]</b>	<b>0.01</b> <b>[0.021]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0.096</b> <b>[0.192]</b>	<b>N-E</b>
SGWE	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
SHRH	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
SMBF	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
<b>SNSG*</b>	<b>26</b>	<b>0.116</b> <b>[0.048]</b>	<b>0.118</b> <b>[0.087]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0.126</b> <b>[0.077]</b>	<b>0</b> <b>[0]</b>	<b>0.072</b> <b>[0.054]</b>	<b>N-E</b>	<b>0.992</b> <b>[0.958]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
<b>SNSN*</b>	<b>0</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>0</b> <b>[0]</b>	<b>N-E</b>
STCT	40	0.163 [0.108]	0.03 [0.042]	N-E	0 [0]	N-E	0.199 [0.207]	0 [0]	0.203 [0.228]	N-E	0 [0]	0 [0]	0.502 [0.597]	N-E
UNID	1	0.004 [0.007]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0.011 [0.021]	N-E	0 [0]	0 [0]	0 [0]	N-E
USG	1	0.004 [0.007]	0 [0]	N-E	0 [0]	N-E	0.013 [0.025]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WLYE	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTBS	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E
WTCP	5	0.021 [0.021]	0.017 [0.034]	N-E	0 [0]	N-E	0.033 [0.049]	0 [0]	0 [0]	N-E	0.256 [0.513]	0 [0]	0 [0]	N-E
WTSK	0	0 [0]	0 [0]	N-E	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E	0 [0]	0 [0]	0 [0]	N-E

Appendix F6. Mini-fyke Net: overall season and segment summary. Lists CPUE (fish/net night) and 2 standard errors in brackets.

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS		SCCN	TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS	ITIP	BARS	BARS
BKBH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BMBF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
BRBT	3	0.033	0	0.057	0	0	0	0	0	0.2	0
		[0.038]	[0]	[0.08]	[0]	[0]	[0]	[0]	[0]	[0.4]	[0]
<b>BUSK*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
CARP	10	0.111	0	0.057	0	0.091	0.583	0	0	0	0
		[0.159]	[0]	[0.08]	[0]	[0.182]	[1.167]	[0]	[0]	[0]	[0]
CNCF	25	0.278	0	0.543	0	0.091	0	0	0.667	0.2	0
		[0.195]	[0]	[0.459]	[0]	[0.182]	[0]	[0]	[0.843]	[0.4]	[0]
ERSN	43623	484.7	2825.714	385.971	213.8	75.455	37.417	567	83.667	696.8	16
		[332.81]	[3419.635]	[359.805]	249.014]	[109.903]	[47.296]	[945.682]	[158.162]	[1021.432]	[0]
FHCB	510	5.667	17.143	4.8	2.2	1.727	4.75	5.571	6.167	8.4	1
		[2.355]	[23.75]	[2.3]	[1.939]	[1.404]	[3.909]	[7.89]	[7.805]	[10.67]	[0]
FHMW	29	0.322	0	0.257	0.4	0.455	0.167	0	1.667	0	1
		[0.23]	[0]	[0.222]	[0.49]	[0.495]	[0.333]	[0]	[2.951]	[0]	[0]
FWDM	4	0.044	0.143	0.029	0.2	0.091	0	0	0	0	0
		[0.044]	[0.286]	[0.057]	[0.4]	[0.182]	[0]	[0]	[0]	[0]	[0]
GDEY	21	0.233	0.286	0.086	0	0.091	0.417	0.143	0.667	0.6	2
		[0.013]	[0.369]	[0.126]	[0]	[0.182]	[0.52]	[0.286]	[0.989]	[0.8]	[0]
<b>HBNS*</b>	<b>287</b>	<b>3.189</b>	<b>2.857</b>	<b>5.657</b>	<b>0.2</b>	<b>1</b>	<b>0.75</b>	<b>1</b>	<b>3.167</b>	<b>1.6</b>	<b>14</b>
		[1.892]	[3.16]	[4.541]	[0.4]	[1.618]	[0.657]	[0.617]	[5.548]	[3.2]	[0]
NTPK	3	0.033	0	0.057	0	0	0	0	0	0	1
		[0.038]	[0]	[0.08]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
PDFH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
<b>PDSG*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
RVCS	277	3.078	1.429	3.114	0	1.455	3.167	2.571	6.833	4.8	1
		[1.065]	[1.625]	[1.629]	[0]	[1.588]	[2.728]	[1.738]	[8.678]	[3.37]	[0]
<b>SFCB*</b>	<b>5</b>	<b>0.056</b>	<b>0</b>	<b>0.143</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		[0.111]	[0]	[0.286]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
<b>SGCB*</b>	<b>2</b>	<b>0.022</b>	<b>0</b>	<b>0.029</b>	<b>0</b>	<b>0.091</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		[0.031]	[0]	[0.057]	[0]	[0.182]	[0]	[0]	[0]	[0]	[0]

## Appendix F6 (continued).

Species	Total Catch	Overall CPUE	CHXO	ISB	OSB	SCCL		SCCS		SCCN	TRMS
			BARS	BARS	BARS	BARS	ITIP	BARS	ITIP	BARS	BARS
<b>SGER*</b>	<b>68</b>	<b>0.756</b>	<b>0.143</b>	<b>0.514</b>	<b>0.2</b>	<b>1</b>	<b>1.167</b>	<b>1</b>	<b>1.667</b>	<b>0.4</b>	<b>4</b>
		<b>[0.304]</b>	<b>[0.286]</b>	<b>[0.405]</b>	<b>[0.4]</b>	<b>[0.661]</b>	<b>[1.202]</b>	<b>[0.976]</b>	<b>[2.171]</b>	<b>[0.8]</b>	<b>[0]</b>
SGWE	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SHRH	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
SMBF	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
<b>SNSG*</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>
<b>SNSN*</b>	<b>4</b>	<b>0.044</b>	<b>0.143</b>	<b>0.086</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
		<b>[0.054]</b>	<b>[0.286]</b>	<b>[0.126]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>	<b>[0]</b>
STCT	5	0.056	0	0.029	0.2	0	0	0.143	0	0	0
		[0.058]	[0]	[0.057]	[0.4]	[0]	[0]	[0.286]	[0]	[0]	[0]
UNID	9	0.1	0	0.029	0	0	0	0.143	0.677	0.6	0
		[0.114]	[0]	[0.057]	[0]	[0]	[0]	[0.286]	[1.333]	[1.2]	[0]
USG	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WLYE	0	0	0	0	0	0	0	0	0	0	0
		[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
WTBS	6	0.067	0	0.143	0	0	0	0	0	0.2	0
		[0.069]	[0]	[0.167]	[0]	[0]	[0]	[0]	[0]	[0.4]	[0]
WTCP	377	4.189	0.143	3.714	0.4	6.727	4.833	0.714	8.5	1.4	49
		[2.342]	[0.286]	[3.851]	[0.8]	[8.52]	[5.221]	[1.131]	[12.042]	[2.8]	[0]
WTSK	2	0.022	0	0.029	0	0	0	0	0	0.2	0
		[0.031]	[0]	[0.057]	[0]	[0]	[0]	[0]	[0]	[0.4]	[0]

Appendix G. Hatchery names, locations, and abbreviations.

<b>Hatchery</b>	<b>State</b>	<b>Abbreviation</b>
Blind Pony State Fish Hatchery	MO	BYP
Neosho National Fish Hatchery	MO	NEO
Gavins Point National Fish Hatchery	SD	GAV
Garrison Dam National Fish Hatchery	ND	GAR
Miles City State Fish Hatchery	MT	MCH
Blue Water State Fish Hatchery	MT	BLU
Bozeman Fish Technology Center	MT	BFT
Fort Peck State Fish Hatchery	MT	FPH

Appendix H. Alphanumeric list of Missouri River fishes with total catch-per-unit-effort by gear type for sturgeon season (fall through spring) and fish community season (summer) during 2005 – 2006 for segment 4 of the Missouri River. Species codes are located in Appendix A. Asterisks and bold type denote targeted native Missouri River species.

Species Code	Sturgeon Season (Fall through Spring)				Fish Community Season (Summer)			
	1 Inch Trammel Net	2.5 Inch Trammel Net	Gill Net	Otter Trawl	1 Inch Trammel Net	Mini-Fyke Net	Otter Trawl	Beam Trawl
BKBH	0			0	0	0	0	0.004
BMBF	0.034			0	0.01	0	0	0
BRBT	0			0	0	0.033	0	0
BUSK	0			0.003	0.05	0	0.005	0
CARP	0.007			0.012	0.021	0.111	0.008	0.01
CNCF	0.129			1.993	0.609	0.278	1.384	1.433
ERSN	0			0.04	0	484.7	0.019	0.022
FHCB	0			0.093	0	5.667	0.075	0.069
FHMW	0			0	0	0.322	0	0
FWDM	0			0	0.008	0.044	0	0
GDEY	0.124			0.003	0.152	0.233	0.055	0.009
HBNS	0			0	0	3.189	0.007	0
NTPK	0			0	0	0.033	0	0
PDFH	0.006			0	0.009	0	0	0
PDSG	0.017			0.004	0.06	0	0.024	0
RVCS	0.017			0.007	0.007	3.078	0.021	0.004
SFCB	0			0.313	0	0.056	0.505	0.378
SGCB	0			0.492	0	0.022	0.457	1.09
SGER	0.16			0.014	0.158	0.756	0.051	0.024
SGWE	0.01			0	0	0	0.009	0
SHRH	0			0	0.044	0	0.013	0
SMBF	0.025			0.036	0.005	0	0.007	0
SNSG	0.129			0.156	1.021	0	0.194	0.116
SNSN	0			0.004	0	0.044	0	0
STCT	0.007			0.077	0.004	0.056	0.156	0.163
UNID	0			0.011	0	0.1	0	0.004
WLYE	0.029			0	0.017	0	0.004	0
WTBS	0			0	0	0.067	0	0
WTCP	0			0	0	4.189	0.021	0.021
WTSK	0			0	0	0.022	0.003	0

Appendix I. Comprehensive list of bend numbers and bend river miles for segment 4 of the Missouri River comparing bend selection for both sturgeon season (ST) and fish community season (FCS) between years from 2005 – 2006.

<b>Bend Number</b>	<b>Bend River Mile</b>	<b>2005</b>	<b>2006</b>
1	1582.1	ST,FCS	
2	1580.8		ST,FCS
3	1578.6	ST,FCS	ST,FCS
4	1577.0		
5	1575.8	ST,FCS	
6	1574.9	ST,FCS	ST,FCS
7	1574.2	ST,FCS	
8	1569.1		ST,FCS
9	1567.2		ST,FCS
10	1565.5	ST,FCS	ST,FCS
11	1563.2		
12	1562.3	ST,FCS	
13	1560.3		
14	1558.0		ST,FCS
15	1555.8		ST,FCS
16	1553.1	ST,FCS	
17	1551.3	ST,FCS	ST,FCS
18	1549.2	ST,FCS	ST,FCS
19	1548.3		
20	1544.5	ST,FCS	ST,FCS
21	1538.8	ST,FCS	ST,FCS
22	1534.0		